

JUNIOR GEOGRAPHY

FRY



UNIVERSITY TUTORIAL PRESS

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Will F. Taylor.

NEW YORK SKYSCRAPERS FROM THE WATER.

Manhattan Island is so small that the buildings have been made very high.

JUNIOR GEOGRAPHY

BY

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PREFACE

THE standard of the book makes it suitable for use in the lower and middle forms of schools. Chapters I to V deal with general physical geography, of which a rudimentary knowledge is indispensable, either for the intelligent use of an atlas, or for reading general descriptive geography. The remaining chapters are based on one general plan, the description of physical features and climate leading on to economic and political geography.

NOTE TO THE EIGHTH EDITION

Opportunity has been taken of the need to reprint this book, to make a number of alterations to the text, and also to bring the statistical sections as up to date as possible. While neither pre-war nor war-time statistics are representative, in many cases, of the rapidly changing conditions of to-day, they do, at any rate, provide a scale with which to compare later figures as these become available.

Eighth Edition 1947

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JUNIOR GEOGRAPHY

CHAPTER I

LATITUDE AND LONGITUDE: SEASONS

GENERAL TERMS

1. The earth rotates once every twenty-four hours round an imaginary line called the *axis*, which passes through the centre of the earth and meets the surface in two points called the north and south *poles*. The *equator* (Fig. 1) is an imaginary line round the earth midway between the poles. It thus divides the surface of the earth into two equal parts, called the northern and the southern *hemisphere*.

The diameter of the earth is nearly 8000 miles, and the circumference is about 25,000 miles. The polar diameter is shorter than the equatorial diameter by nearly thirty miles, so that the earth is not a perfect sphere.

If the circumference of a circle is divided into 360 parts, each part subtends at the centre an angle which is called a *degree*. Degrees are divided into 60 parts called *minutes*, and minutes into 60 parts called *seconds*. These terms are denoted by the symbols °, ', "; thus 39° 5' 59" means 39 degrees, 5 minutes, 59 seconds.

In geography these terms are applied to the positions of places on the surface of the earth, expressed in terms of their distance (in degrees, etc.) from the equator (Art. 2) and from a fixed north and south line, the zero meridian (Art. 3). When we say that "a degree is 69 miles," this means that a line 69 miles long on the surface of the earth would subtend an angle of one degree at the centre of the earth. [Degrees are not always 69 miles, as will be seen in Art. 3.]

There is no connection between a "minute" as a measurement of time and a "minute" as part of a degree.

LATITUDE

2. The latitude of a place is its position expressed in terms of its distance north or south of the equator, measured in degrees, etc.

The axis NS (Fig. 1) cuts the plane of the equator at right angles. Hence the north and south poles are in latitudes 90° N. and 90° S. respectively, because lines drawn from them to the centre of the earth meet the plane of the equator at right angles (see Fig. 2). Now consider the circle DEF, parallel to the equator. A line drawn from *any* point on this circle to the centre of the earth would subtend an angle of, say, 30° with the plane of the equator. That is, *all* points on this circle are in the same latitude, which is 30° N.

Lines of latitude are often called *parallels*, because they are all parallel to the equator. Latitude is measured from 0° at the equator to 90° at the poles, the letter N. or S. being added to distinguish places north or south of the equator.

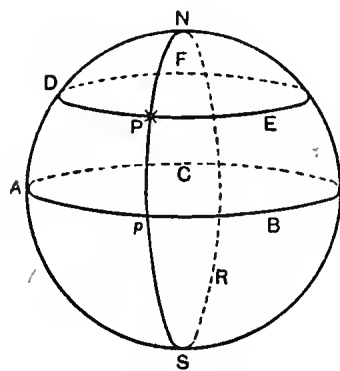


Fig. 1.

ABC, GREAT CIRCLE (Equator).
DEF, SMALL CIRCLE (Parallel of Latitude).
NRS, GREAT CIRCLE (Two Meridians of Longitude).
NS, EARTH'S AXIS.

LONGITUDE

3. The *meridian* of a place is a line passing through that place in a due north and south direction; or, a semicircle drawn from the north pole to the south pole through any given place is the meridian of that place. The semicircle NPS (Fig. 1) is the meridian of the point P.

The meridian of the Royal Observatory at Greenwich has been taken by English-speaking nations and

some others as an Initial or Zero Meridian, from which all other meridians are numbered.

The longitude of a place is its position, expressed in terms of the distance in degrees, etc., measured east or west, from the meridian of Greenwich to the meridian of that place.

Longitude is measured from 0° to 180° E. for places east of Greenwich, and from 0° to 180° W. for places west of Greenwich; 180° E. and 180° W. are the same meridian.

The length of a degree of latitude is everywhere about 69 miles, though there are small variations due to the fact that the earth is not a perfect sphere.

The length of a degree of longitude at the equator, (where the meridians are furthest apart, is also about 69 miles. At the poles, since all the meridians meet there, a degree of longitude has no length. In the latitude of London, a degree of longitude measures about 43 miles.

Any world map in hemispheres, and most maps of continents, will show how degrees of longitude diminish as the latitude approaches the poles. Maps on Mercator's projection, which show degrees of longitude as the same length everywhere, are seriously misleading in this respect.

The following table shows the variation in the length of a degree of longitude for each 10° of latitude between the equator and the poles, and also gives the duration of daylight (excluding twilight) for the shortest day and the longest day in each latitude. This part of the table will be explained later.

Note especially in the table the figures for latitudes 50° and 60° , as these are approximately the latitudes of the south of England and the north of Scotland respectively.

VARIATION IN LONGITUDE AND DURATION OF DAYLIGHT AT DIFFERENT LATITUDES

LATITUDE $^\circ$	LENGTH OF 1° OF LONGITUDE MILES	SUN'S CENTRE ABOVE HORIZON			
		SUMMER H.	SOLSTICE M.	WINTER H.	SOLSTICE M.
0	69.2	12	6	12	6
10	68.1	12	38	11	30
20	65.0	13	18	10	52
30	60.0	14	0	10	10
40	53.1	14	58	9	16
50	44.6	16	18	8	0
60	34.7	18	44	5	44
70	23.7	24	0	0	0
80	12.5	24	0	0	0
90	0	24	0	0	0

A degree of *latitude* is 68.7 miles at the equator, and 69.4 miles in the polar regions. Notice that up to lat. 30° there is little variation in the length of a degree of longitude, while at higher latitudes the differences increase rapidly.

It should be clearly remembered that though measurement of position can only be made on the surface of the

measurements of both latitude and longitude really refer to angles subtended at the centre of the earth. This may be made more clear by Fig. 2, which represents the earth with a section cut out of it, as a slice is cut out of a melon. O is the centre of the earth. GE represents the meridian of Greenwich (G).

Then the latitude of Greenwich is the angle GOE.

“ “ “ N. “ NOE’.
“ longitude N. “ E’OE.

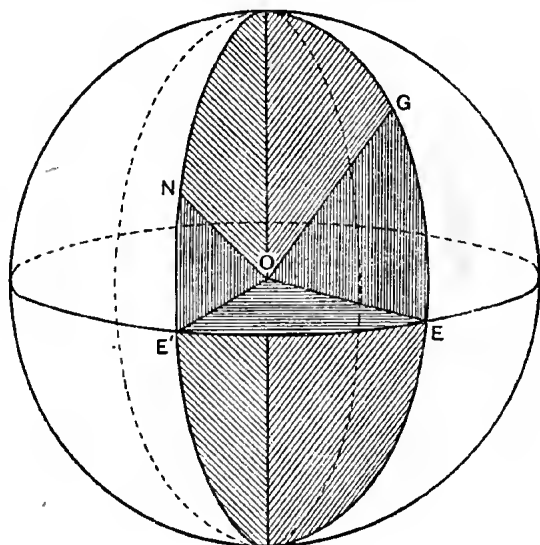


Fig. 2.

LOCAL TIME

4. The apparent movement of the sun from east to west is due to the rotation of the earth in the opposite direction, from west to east. As a complete rotation (360°) takes place in twenty-four hours, the rate is 15° in one hour, or 1° in four minutes.

Noon (*meridies*) at any place is the time when the sun reaches its highest point in the sky, or when the meridian of that place comes directly beneath the sun, *i.e.* when from any point on that meridian the sun is either due south (in the northern hemisphere), due north (in the southern hemisphere), or vertically overhead.

Canterbury is about 1° E. of Greenwich, and Reading about 1° W. Therefore the meridians of Canterbury, Greenwich, and Reading pass directly beneath the sun at intervals of four minutes. Thus when it is noon at Greenwich the *local time* at Canterbury is 12.4 p.m., but at Reading it is only 11.56 a.m.

It would be so highly inconvenient for each town to keep its own local time, that (except for the lighting up of vehicles, for which local time is used) all the United Kingdom takes its time from Greenwich. French time is also the same as that of Greenwich. Most of Central Europe takes its time from Berlin, one hour in front of Greenwich.

The United States is divided into four “time-belts”—Atlantic, Prairie, Mountain, and Pacific—whose times are respectively five, six, seven, and eight hours behind Greenwich time. Thus when it is noon at Greenwich, it is only 4 a.m. at San Francisco, and 7 a.m. at New York.

If you cross the United States from New York to San Francisco, you would put back your watch one hour on going from each time-belt into the next one.

When it is noon at Greenwich, the time is “a.m.” at all places west of Greenwich, as far as longitude 180° , and “p.m.” at all places east of Greenwich, as far as the same line of 180° (approximately the east of New Zealand), and on that line the time is midnight. The rate of variation is four minutes for each degree of longitude.

THE SEASONS

5. The plane in which the earth moves round the sun in a nearly circular path (really an ellipse) is called the *ecliptic*. The earth’s axis of rotation is not at right angles to the ecliptic, but makes an angle of about $66\frac{1}{2}^\circ$ with it. To this fact are due the changes of the seasons and the varying lengths of day and night.

If possible, verify the following facts in a darkened room, with a lamp to represent the sun and a globe to represent the earth. There should be a distance of several feet between the lamp and the globe.

The line joining the centre of the earth to the sun will be called the *earth-sun line*. Owing to the great distance of the earth from the sun (about ninety-three million miles) all the sun’s rays which touch the earth are practically parallel.

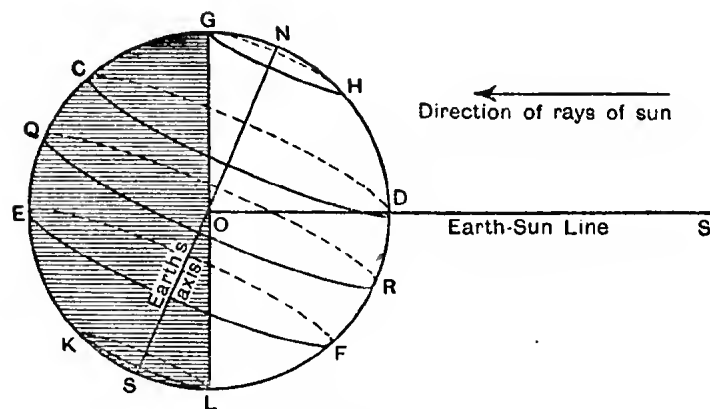


Fig. 3a.

6. Place the globe so that the northern half of the axis, ON (Fig. 3a), makes an angle of $66\frac{1}{2}^\circ$ with the earth-sun line, and rotate the globe on its axis.

It will be seen that in the northern hemisphere more than one-half of each parallel of latitude is in the light, and less than one-half in the shade. Hence as the earth rotates, any point in the northern hemisphere will be longer in the light than in the shade, that is, will have more day than night.

That part of the earth from HG to the north pole N is continuously in the light, and thus the sun is above the horizon during the whole twenty-four hours. This is "The Land of the Midnight Sun."

Conversely, that part of the earth from KL to S is in continuous darkness, and all places south of the equator have more night than day.

The earth is in the above position on June 21st, and this day is called the summer solstice. It is summer in the northern hemisphere, but winter in the southern hemisphere. The sun shines vertically on latitude $23\frac{1}{2}^\circ$ N., which is called the *Tropic of Cancer*. The parallels of $66\frac{1}{2}^\circ$ N. and $66\frac{1}{2}^\circ$ S. (GH and KL in Fig. 3a) are called the *Arctic Circle* and the *Antarctic Circle* respectively.

7. Move the globe through a semicircle to the other side of the lamp, keeping the inclination of the axis fixed. The state of things is now represented by Fig. 3b. The period is

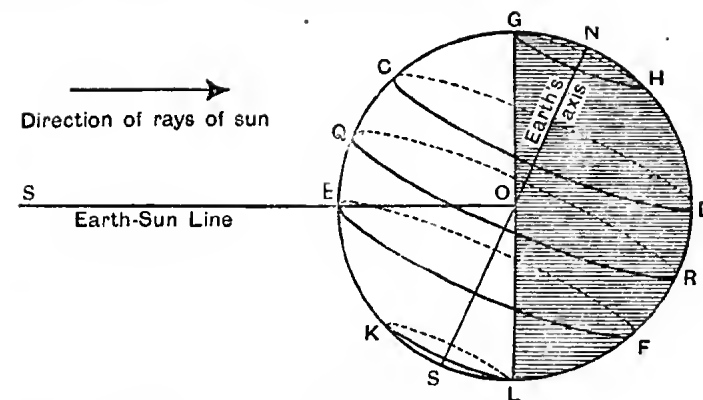


Fig. 3b.

now six months later, *i.e.* December 21st, and is called the winter solstice. It is winter in the northern, summer in the southern hemisphere. The south pole is in continuous daylight, the north pole in continuous darkness. The sun shines vertically on latitude $23\frac{1}{2}^\circ$ S. (EF in Fig. 3b), which is called the *Tropic of Capricorn*.

8. Again move the globe through a quarter of a circle (representing three months) from either of the positions representing the solstices. The axis, though still making an angle of $66\frac{1}{2}^\circ$ with the ecliptic, is now at right angles to the earth-sun line (Fig. 4). The sun shines vertically on the

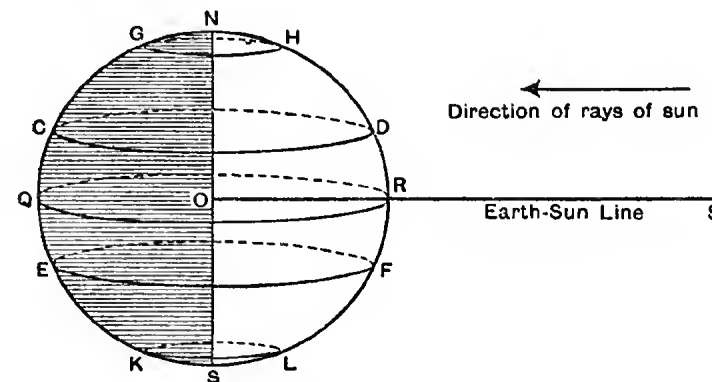


Fig. 4.

equator, and all parts of the earth have days and nights of equal length. Hence the times when the earth is in these positions are called the *equinoxes* (*aequus*, equal; *nox*, night). The vernal or spring equinox is on March 21st, and the autumnal equinox on September 23rd.

The above facts are somewhat imperfectly represented in Fig. 5.

9. To sum up: in the northern hemisphere the length of daylight *increases* from December 21st (the winter solstice)

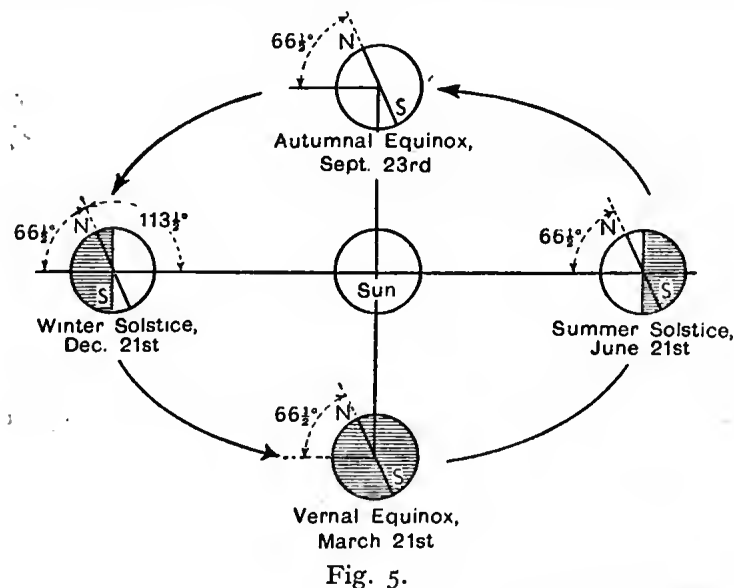


Fig. 5.

to June 21st (the summer solstice), day and night being of equal length on March 21st (vernal equinox). After March 21st (till September 23rd) the length of daylight increases as we go northwards from the equator, till around the North Pole daylight is continuous, the sun never sinking below the horizon.

From June 21st to December 21st the duration of daylight *decreases*, day and night being of equal length on September 23rd (autumnal equinox). After September 23rd (till March 21st) the length of daylight decreases as we go northwards from the equator, and a region round the North Pole is in continuous darkness, the sun never rising above the horizon.

The above statements can be simply reversed for the southern hemisphere.

Figures showing the lengths of the longest and shortest days in different latitudes are given in Art. 3. It is important to keep in mind that at the equator day and night are *always* equal, and that up to 10° or 15° from the equator there is very little difference between the longest and the shortest day, which differ so markedly in higher latitudes.

ZONES OF THE EARTH

10. Fig. 6 shows the zones or belts into which the earth is divided by the Arctic and Antarctic Circles and the two tropics.

The *Torrid Zone* is often loosely called the *Tropics*, but strictly the tropics are the two lines of latitude, $23\frac{1}{2}^\circ$ N. and $23\frac{1}{2}^\circ$ S., which are the furthest north and furthest south positions at which the sun is ever vertically overhead; these lines are called respectively the Tropics of Cancer and of Capricorn. At points between the tropics of Cancer and Capricorn the sun shines vertically at midday on two days in each year.

The *Arctic Regions* are between the Arctic Circle and the North Pole, and similarly the *Antarctic Regions* are between the Antarctic Circle and the South Pole. They are sometimes called the *Frigid Zones*, though, strictly, they are not zones.

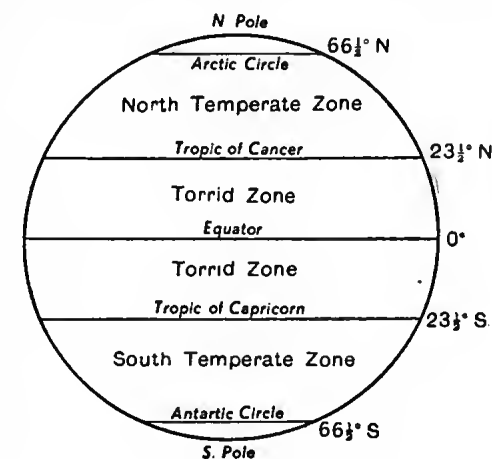


Fig. 6.
ZONES OF THE EARTH.

QUESTIONS ON CHAPTER I

1. Find the latitude and longitude, to the nearest degree, of the following places:—

London.	New York.	Calcutta.	Sydney.
Edinburgh.	New Orleans.	Singapore.	Cape Town.
Carlisle.	San Francisco.	Peking.	Buenos Aires.

2. Find the towns the positions of which are given approximately below—

Lat.	Long.	Lat.	Long.
(a) 48° N.	2° E.	(e) 30° S.	31½° E.
(b) 43° N.	6° E.	(f) 18° N.	77° W.
(c) 53½° N.	10° E.	(g) 23° S.	43° W.
(d) 7° N.	80° E.	(h) 41½° S.	175° E.

3. Give the longitudes of the points where the equator cuts the coast line of Africa and South America, and hence calculate the width of these continents at the equator.

4. How many degrees is Edinburgh north of Greenwich? Suppose it were due north, how far would this be? If Dublin were due west of Greenwich, calculate its approximate distance.

5. Find the local time at the towns given in questions 1 and 2, when it is noon at Greenwich.

6. Find the longitude when local noon occurs at (a) 7.20 a.m., (b) 5.40 p.m., by Greenwich time.

7. During how much of each year is the sun above the horizon at (i) the North Pole, (ii) London, (iii) Singapore?

8. Explain the terms latitude, meridian, tropic, equinox, solstice.

9. What differences would you notice between the length of daylight in Edinburgh and London (a) in December, (b) in June?

10. When it is 5 p.m. at Greenwich, in which longitude is it (a) midnight, (b) noon? Give the day and hour at Tokio (140° E.) and at San Francisco (122° W.), when the Greenwich time is 5 p.m. on Wednesday.

11. Using atlas or wall maps of (1) England and Wales, (2) Scotland, find by measurement, to the nearest mile, using the scale of miles attached to each map, the length of a degree of longitude in the latitudes of (a) Lizard Head, (b) Newcastle, (c) Orkney Islands. Compare your results with figures for 50° N. and 60° N. in table in Art. 3.

12. Two persons, one living close to the equator, and the other at Birmingham (England), compare their observations of the midday altitude of the sun at midsummer and at midwinter. What differences would their observations show? Draw a diagram to make your explanation clearer.

13. What is meant by the statement that the latitude and longitude of Sydney are 34° S. and 150° E.? Explain why it is that the morning editions of London papers give the close of play scores of cricket matches played the same day in Australia.

14. How do we know that the earth is almost a sphere in shape? State briefly what movements it makes, and what results are produced by these movements.

CHAPTER II

MAPS AND MAP-READING

GLOBES AND MAPS

11. As the surface of the earth is practically the surface of a sphere, globes or portions of globes are the only means of representing the earth accurately. But globes of any ordinary size are much too small to show details, and recourse has to be had to maps, in which the spherical surface is reduced (always with more or less distortion or alteration of shape) to a plane.

A map is a representation of all or part of the earth's surface. *Relief-maps* are actual models of the surface, showing mountains, valleys, and other land forms by elevations and depressions on the map. To make even relief-maps useful, however, the heights of mountains and hills have to be exaggerated, or they would scarcely show. In this case the horizontal and the vertical scales of the maps are different, and it is not, therefore, a true model.

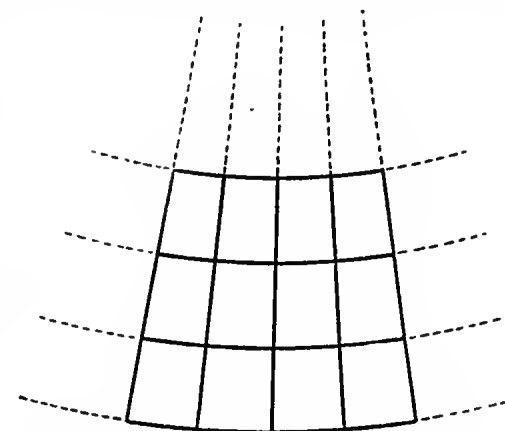


Fig. 7. LINES OF LATITUDE AND LONGITUDE. CONICAL PROJECTION.

12. We shall confine our attention here to ordinary flat maps, which indicate the height of the land by various devices. We shall also omit any description of the numerous methods of *map-projection*, methods, that is, of reducing a spherical surface to a plane with as little alteration in shape as possible. Two of these projections, however, which are of special importance, may be mentioned.

(i) The conical projection (Fig. 7) is chiefly used for maps of separate countries, e.g. England or France. It makes the

lines of longitude straight lines converging towards the north or south, and the lines of latitude parts of concentric circles. It is a good projection for maps of comparatively small areas, though, as may be seen from Fig. 7, there is some distortion of direction towards the edges of the maps, since meridians represent north and south directions.

(ii) Mercator's projection (Fig. 8) makes both lines of latitude and longitude straight lines intersecting at right angles, but the distance between the lines of latitude increases in high latitudes. This projection is chiefly used for maps of the whole world (except the polar regions) and for nautical

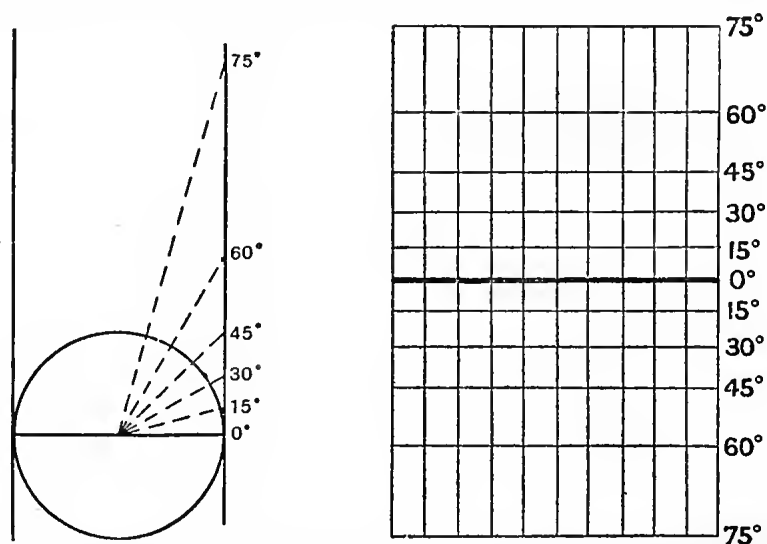


Fig. 8. MERCATOR'S PROJECTION. EACH RECTANGLE REPRESENTS 15° OF LATITUDE AND LONGITUDE.

charts. Its great disadvantage is that it exaggerates the areas of countries far from the equator. It makes Alaska look nearly as big as the United States, though the latter is really about five times as big as the former. It makes Iceland look much bigger than Java, though in reality it is considerably smaller. The advantages of Mercator's projection are (i) that since all meridians and parallels cross at right angles, as on the globe, it gives *directions* correctly; (ii) it gives correctly the *shapes* of small areas, *e.g.* Newfoundland, but in a large area such as Canada the north is much more exaggerated than the south, and the shape as a whole is altered.

It is important to realise that no map of a large area of the earth's surface can be quite accurate, as a spherical surface cannot be flattened without distortion of some kind. Some maps aim at giving areas correctly, and in these the shapes and directions are usually distorted towards the edges of the map. Other maps give shapes and directions fairly correctly, but exaggerate or diminish areas in different parts of the map.

Study the arrangement of meridians and parallels in the different world-maps in your atlas, noting whether the lines are curved or straight, and realise that *all* these world-maps are misleading in some way. Study also the shapes and apparent relative sizes of, *e.g.*, Asia, Greenland, South America, and Australia in the different world-maps.

THE SCALE OF MAPS

13. The scale of a map is the ratio which its linear dimensions bear to the linear dimensions of the region represented by the map. The scale may be expressed in three different ways: (1) by a line representing any convenient number of miles or yards; (2) by a fraction with unity as numerator; (3) as so many inches to a mile, or miles to an inch.

Thus the general map of the British Ordnance Survey is on a scale of one inch to a mile. The "representative fraction" of this scale is $\frac{1}{63360}$, since 63,360 inches are equal to one mile. The meaning of this is that any particular portion of the country shown on the map (say, a field) is 63,360 times as long, and also 63,360 times as wide, as that portion of the map which represents it. The great "International Map" of the world, which is being published in sections, is on a scale of one to a million, which is nearly 16 miles to an inch.

14. The amount of information that can be put on a map obviously depends on the scale. A 6-inch Ordnance map (*i.e.* 6 inches to one mile) shows every field, farm, and lane or street. A 1-inch map shows every church, road, village, and the principal streets of towns. In Bartholomew's "Touring Atlas of the British Isles" (10 miles to an inch) only the main roads are shown, and the smaller villages are omitted. The map of England found in an ordinary atlas omits many smaller tributaries of the rivers, many branch lines of railways, almost all villages and some towns; while

the maps of other countries are given on a still smaller scale, and therefore show even less detail. Outside Europe a large part of the world is still so imperfectly surveyed that it would be impossible to construct accurate large-scale maps.

CONTOUR LINES

15. For geographical purposes it is of great importance that maps should show *land-relief*, that is, the varying elevations of moun-

tain, valley, and plain, which are of such great importance in fixing the flow of rivers, and in their effects on climate and on the routes of roads and railways.

Contour lines are lines joining together places of *equal elevation*.

Imagine a conical hill of regular shape rising from sea-level to a height of, say, 380 feet. If the top of the hill were cut off down to a level of 300 feet, the top would then be a flat circle, 300 feet high.

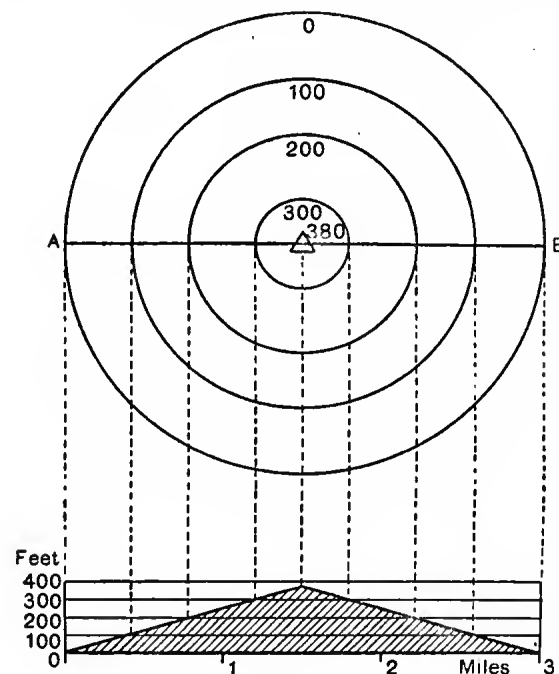


Fig. 9.

If another section were taken off down to 200 feet level, the top would then be another larger circle. Similarly, the 100 feet level is a still larger circle. Thus Fig. 9 shows the contours of such a hill, and also illustrates the method of drawing a *section* from contours. The shaded triangle at the bottom of the figure is a vertical section of the hill along the line AB. From each point where a contour line crosses the line AB a perpendicular is drawn to the horizontal line in the bottom figure representing the height of

CONTOUR LINES

that contour. The feet of these perpendiculars are then joined.

Now suppose that the hill, instead of being a regular cone, is oval in shape, and has a steep slope on the west and a much more gentle slope on the east. The contours and section would then be as in Fig. 10, which illustrates the important point that where contours are crowded together they represent a steep slope.

Fig. 11 represents the contours of a pass or "neck," between 500 and 600 feet high, across a uniform ridge between 800 and 900 feet high. The shaded parts of the figure represent sections along the lines AB and CD.

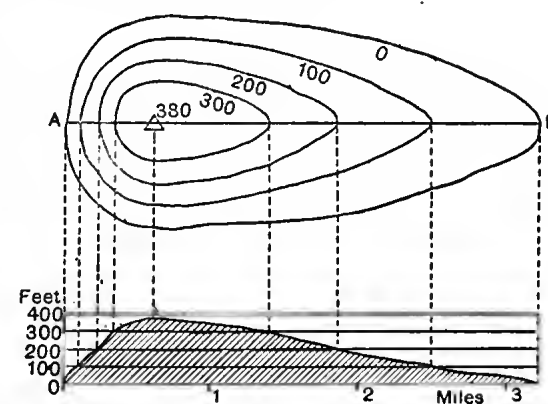


Fig. 10.

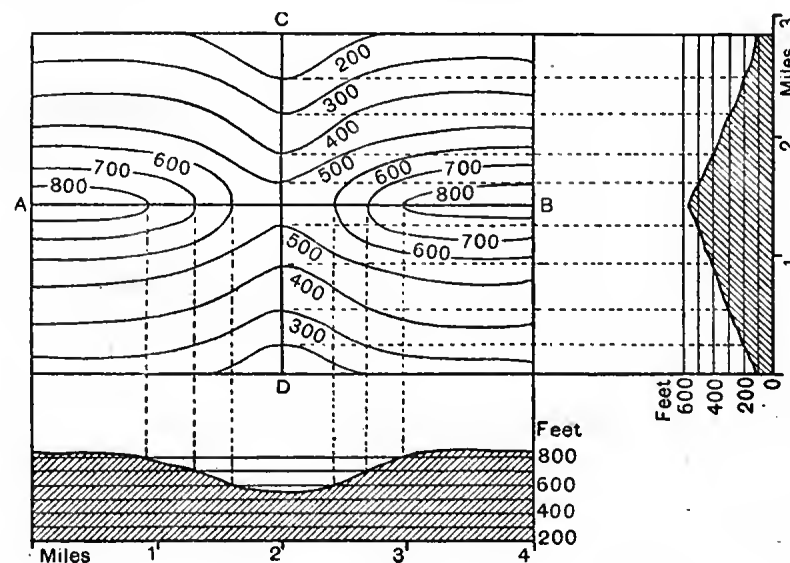


Fig. 11.

16. In nature contours are very seldom so simple as those shown in the above figures, as the surface of the earth is generally very irregular. Fig. 12 shows the contours of a rather steep-sided river valley with some tributaries. The streams are drawn in thicker lines, with arrows showing the direction of flow. Notice in this map the connection between

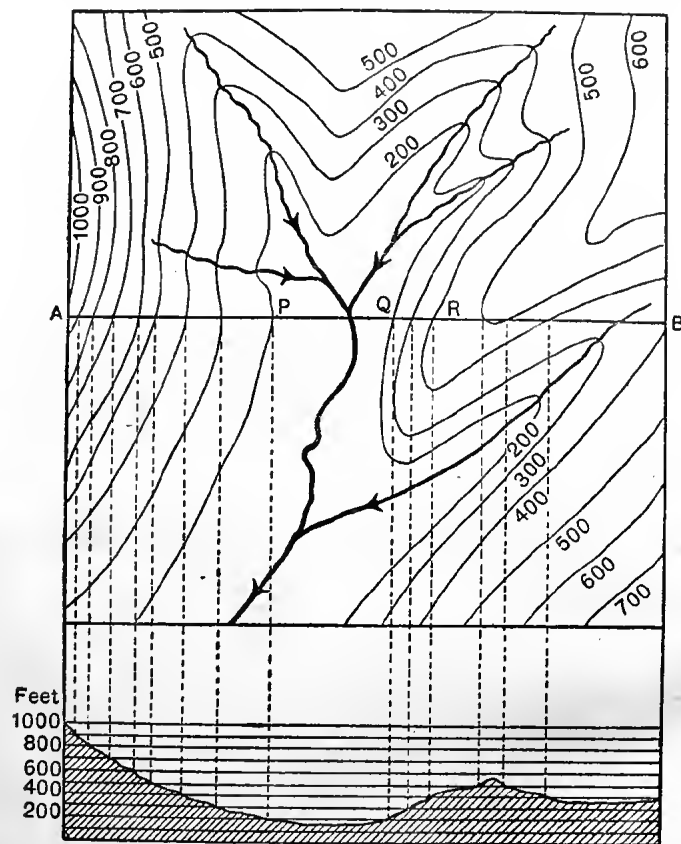
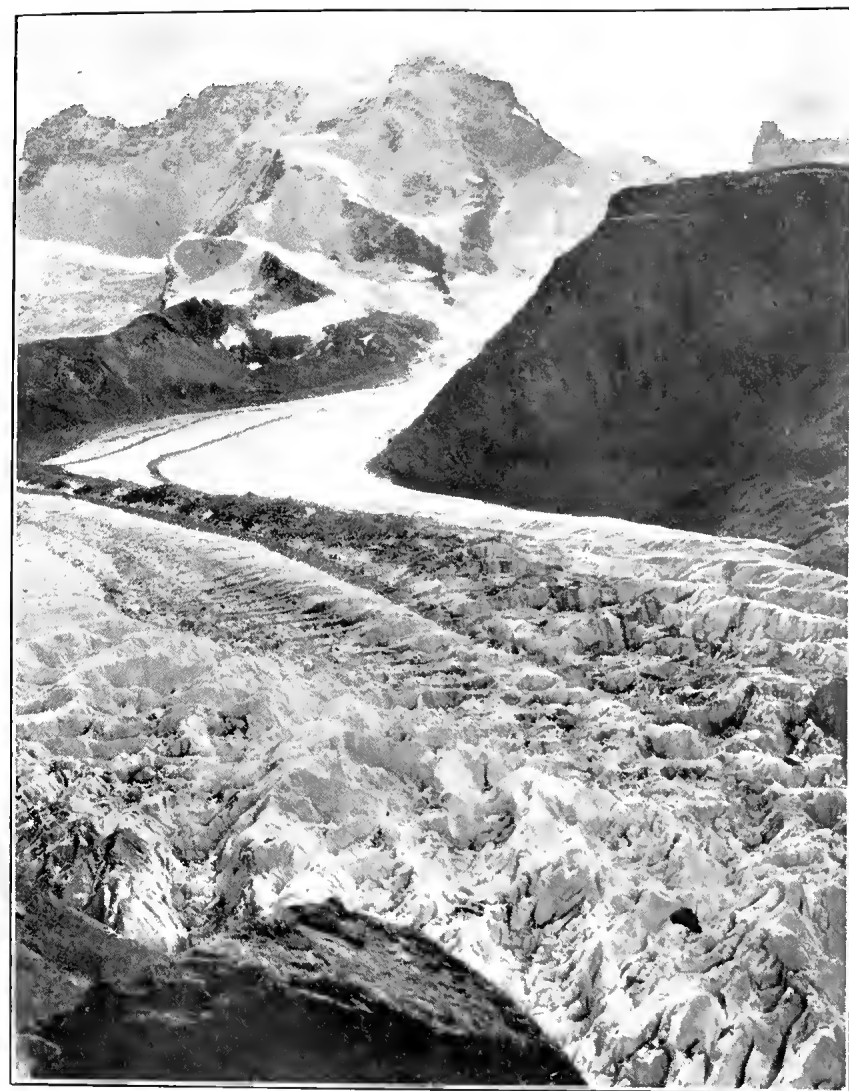


Fig. 12.

streams and V-shaped contours. This connection is so close in a well-watered country that if one is given a map on which contours alone are marked, it is generally possible to draw the courses of the streams with considerable accuracy, though in a flat-bottomed valley streams "meander" a good deal.

The bottom part of Fig. 12 shows a section from A to B. Notice that between A and P on the map the contours



Swiss Federal Railways

A SWISS GLACIER.

Notice the unevenness of the surface of the ice, and the dark bands of morainic material.

are closer together near the top of the hill than they are near the bottom. This means that the hill between A and P has a concave slope, *i.e.* becomes steeper near the top, and therefore the point A will be visible from P. The section also shows this. On the other side of the main valley, between Q and R, the steeper slope is near the bottom, that is, the slope is convex, and R will not be visible from Q. This can also be easily seen from the section. Such questions as this, regarding the visibility of one point from another, are clearly of great importance in connection with military operations.

17. It is usually necessary, in drawing sections of a considerable stretch of country, to exaggerate the vertical scale. Thus if the horizontal scale of the map is one inch to a mile, and the vertical scale is $\frac{1}{16}$ inch to 100 feet, the latter scale is 5.28 inches to a mile, or 5.28 times the horizontal scale. This means that all the slopes in the section will be 5.28 times as steep as they are in reality. If the vertical scale is $\frac{1}{8}$ inch to 100 feet, the exaggeration is still about 3.3.

A section of a country like England drawn accurately to scale would, unless the scale were a very large one, appear merely as a straight line, since the height of even the highest mountain in England is only an insignificant fraction of the width of the country.

GENERAL MAPS

18. Of course ordinary maps have to show many things besides contours, and they cannot show contours as prominently as the figures just given. In some maps the land-relief is shown by "hill-shading." This is done by "hachures," which are short lines crossing the contours at right angles. The density of the shading is made proportional to the steepness of the slope. In "orographical" maps the spaces between the contours are tinted, either by different shades of the same colour, or by different colours. A common arrangement is to use shades of green for lowlands and shades of brown for highlands. "Bathymetric" maps are those which show the depths of the sea, usually by shades of blue, increasing in darkness with the depth.

The maps above mentioned are all "physical" maps, because they represent physical features, chiefly land-relief and rivers. "Political" maps, on the other hand, show towns, divisions of countries, counties, etc. Many maps show both "political" and "physical" features.

There are also maps drawn to represent some special set of facts, *e.g.* temperature, rainfall, railways, density of population, distribution of vegetation, etc. You will find maps of these kinds in your atlas.

Map-reading, *i.e.* studying the meaning of maps of various kinds, and acquiring information from maps, is of the utmost

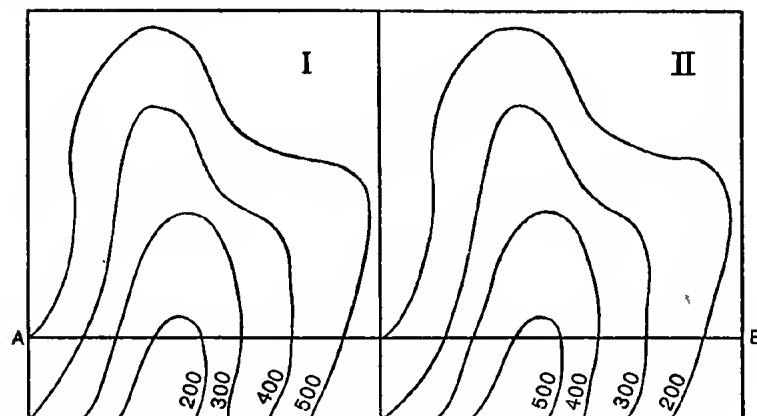


Fig. 13.

importance in the study of geography, and the atlas should be in constant use. Much accurate information about any given country can be (and should be) obtained from maps alone, without reference to books.

QUESTIONS ON CHAPTER II

1. Calculate the "representative fraction" of maps drawn on a scale of (a) six inches to a mile, (b) twenty-five inches to a mile, (c) ten miles to an inch.
2. Calculate the number of miles to an inch on a map of which the representative fraction is $\frac{1}{1000000}$.
3. What is the area in acres of a square field, each side of which measures one inch on a map, the scale of which is six inches to a mile?

4. Find in miles the width of England along the parallels of 51° N., 53° N., 55° N. Compare with the approximate result obtained by measurement according to longitude (use Table in Chapter I.).
5. Illustrate by means of contour lines (a) a mountain with two peaks, (b) an undulating plain with a river flowing through it.
6. In Fig. 13 there are two sets of contours, of exactly the same shape in both cases. Draw sections along AB. What differences are there in the sections? What does I represent? What does II represent?
7. Write a description of any English county, or group of counties, or river basin, making use *only* of information obtained directly from maps.
8. Write, in the same way, a description of some country in Europe.
9. If Ordnance maps are available, write a description of the route by road or rail between two towns shown on the map, noting differences of elevation, hills crossed or avoided, streams crossed or followed, etc.
10. Draw a contoured sketch-map of a river valley, the scale to be one inch to a mile, and the vertical interval between contours 100 feet. The source of the river is about 400 feet above sea-level, and its length about five miles.

CHAPTER III

LAND FORMS

GENERAL

19. The chief land forms may be roughly classified into mountains and hills, valleys, plains, and table-lands or plateaux.

Mountains and *hills* are elevations rising with fairly steep slopes above the level of the surrounding country. It is impossible to state exactly what constitutes the difference between them. Sometimes heights below 1000 feet are called hills, and heights above 1000 feet mountains, but this distinction is quite unmeaning. Generally, mountains are steeper and more rugged than hills.

A *plain* is an expanse of level, or nearly level, land. Some plains, as the Fen district of England, are almost perfectly flat, with no slopes perceptible to the eye; but as a rule an extensive plain consists of "rolling" or undulating country, or a succession of wide gently-sloping valleys separated by *low* hills. Flatness such as that of the Fens and the greater part of Holland is quite exceptional.

The words *plateau* or *table-land* are somewhat vague terms, generally meaning a high plain which descends on all sides to lower ground. A high plain more or less completely surrounded by mountains is also often called a plateau. Generally speaking, the surface of a plateau is much less uniform than that of a low plain. The river valleys are deeper and narrower, and their sides are so steep and irregular that, looked at from the valleys, the country appears quite mountainous; but a wide view from one of the highest points discloses an undulating but approximately level country, the narrow valleys being mostly hidden from view. The term "*dissected plateau*" has been applied to such highland regions intersected by deep narrow valleys. The Highlands of Scotland are a typical example.

20. A *valley* is formed by the meeting of two downward slopes, which may be (1) very steep and near together, forming a cañon, gorge, or defile; (2) steep, but separated by a considerable expanse of fairly level ground; or (3) only

sloping very gently. Nearly all valleys have a stream or river running along their central line where the two slopes meet. The majority of valleys have been produced by the action of rivers—an action which may be seen imitated on a small scale on any steep untarred road during very heavy rain. Some valleys, however, are the result of the "folding" of the earth's crust which formed ranges of mountains (Art. 21).

A *watershed*, water-parting, or divide, is the line where two upward slopes meet. As water necessarily flows downhill, the top of a ridge separates streams flowing down one side from those flowing down the other side. Hence the name "water-parting." A watershed does not always lie along the highest points of a mountain system, but the watershed is necessarily higher than any point on the rivers it separates.

The *basin* or drainage-area of a river is the whole area from which water drains into that river. All rivers, except those that rise in glaciers (Art. 29), are dependent on rainfall. Rain generally sinks into the earth where it falls, and gradually goes downwards through soil, sand, and other porous rocks, till it meets a layer of "impermeable" rock (such as clay) through which it cannot penetrate. The underground water then flows along the upper surface of this impermeable rock till finally it reaches the surface again and emerges as a spring, which supplies a stream. There are in most countries vast stores of underground water, which can be reached by boring wells of greater or less depth.

Most rivers flow into the sea, but nearly a quarter of the earth's surface has "inland drainage," *i.e.* its water runs into hollows completely surrounded by higher ground, and having therefore no outlet to the sea. Such hollows as a rule contain salt lakes, or beds of salt, the remains of lakes.

MOUNTAINS

21. Mountains can be broadly divided into three classes or types—

- (1) Folded or Alpine mountains.
- (2) Block mountains and Plateaus.
- (3) Volcanoes.

Folded mountains seem to be produced by more or less horizontal movements of the earth's outer layers or crust,

causing folding or wrinkling of the surface; but the causes of these movements are not fully understood. If some heavy weights are placed on a thick tablecloth, and the cloth is then pushed horizontally, it will wrinkle up into folds rather like the great mountain ranges of the world, *e.g.* Alps, Himalaya, Andes.

A true mountain range very seldom consists merely of one fold. There are two or more (sometimes very many) nearly parallel ridges, with long wide valleys, called longitudinal valleys, between them. The sides of the ridges are furrowed with narrower transverse or lateral valleys, which have been worn out by streams or glaciers flowing down into the longitudinal valleys. Where two lateral valleys lie on opposite sides of a ridge the crest of the ridge is often considerably lowered, and the "neck" or "saddle" lying between the two valleys is called a *pass*. Passes are of great importance in determining the routes of roads or railways across mountain ranges. The passes across the Alps vary from about 4,000 to 8,000 feet, while the main ridges are generally 10,000 feet or more in height.

Very often a range of mountains or hills has a steep slope on one side and a much more gradual one on the other. The steeper slope of such a range is called an *escarpment*. For example, the Cotswold Hills rise very steeply from the Severn valley on the north-west, and fall much more gradually to the Thames valley on the other side. The northern Pennines have a steep escarpment facing the Eden valley, and a gradual slope on the eastern side. In the Pennines as a whole, and also in the Welsh mountains, the main watershed and the highest summits are near the western side.

22. *Block mountains* are due not to horizontal but to vertical movements, either up or down. They are parts of the earth's crust, sometimes of large area, which have been lifted up above the surrounding country, or have been left standing while other blocks near them have sunk. The Grampian Highlands of Scotland are an old "crust-block" between two sunken areas, the Lowlands in the south and the narrow valley of Glenmore in the north. The block has been much worn down by "weathering" and erosion, *i.e.* the action of rain, wind, frost, glaciers (Art. 29), and rivers (Art. 25). The mountains that remain above the general level in

such a region as this are composed of rocks which are specially hard or specially resistant to the action of water. Such mountains are sometimes called "residual" mountains. They are found irregularly in groups and knots, not in the regular long ridges that are found in folded mountains. The central plateau of France is a typical crust-block. The Cevennes Mountains, on the eastern side, looked at from the Rhone valley, appear as a mountain "range," but are merely the steep fractured edge of the crust-block.

VOLCANOES

23. *Volcanoes* are conical mountains built up of materials thrown up from openings in the earth's crust. The volcano is said to be in "eruption" during the time when it is ejecting materials. Generally speaking eruptions only last a few hours or days, at intervals of months or even years, but a few volcanoes (*e.g.* Stromboli in the Mediterranean) are almost continually active.

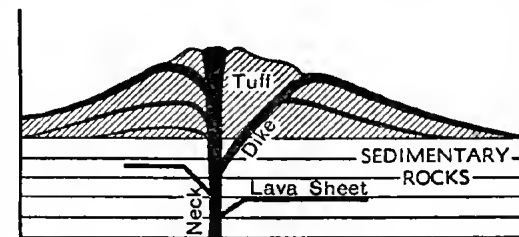


Fig. 14. SECTION OF A VOLCANO.

Black shading = lava. Light shading = tuff.

Volcanoes are classified as "active" when eruptions occur with some frequency; "dormant" when no eruption has occurred for a long period of years; and "extinct" when no eruption is known to have taken place within historical times.

Fig. 14 shows a section of a typical active volcano. The cup-shaped hollow at the top is called the *crater*. Notice of an eruption is generally given by large quantities of steam and sulphurous gases rising from the crater. Owing to the steam an eruption is often followed by heavy rain, and the gases produce deposits of sulphur around the volcano.

Fragments of rock are often flung up to a great height by the outburst of steam. After these warnings the crater fills up with melted rock called *lava*, which either overflows the crater or breaks through its rim, and flows down the slope of the mountain till it becomes cool enough to solidify.

Sometimes lava breaks through the side of a volcano instead of rising to the crater. A secondary cone is then formed by the deposit of material round the new outlet.

Volcanoes are chiefly built up of volcanic *ash* or *scoria*, which consists of fine fragments produced by the violent outburst of steam through lava. The ash settles more or less evenly round the crater, and produces the conical shape of the mountain, forming by its own pressure a soft rock called *tuff*. *Pumice stone* is a sort of froth or foam formed on lava by gas or steam blown through it.

Active volcanoes are generally near the sea. The largest and most important occur near the Pacific coast, which has been described as a "ring of fire." A large number of oceanic islands are also volcanic. In Europe, though there are many extinct volcanoes, active ones are found only in parts of the Mediterranean regions. The most famous are Vesuvius (about 4,000 feet) near Naples, Etna (nearly 11,000 feet) in Sicily, and Vulcano, which has given its name to the whole class of similar mountains.

TEMPERATURE OF THE EARTH

24. The fact that the interior of the earth is very hot is shown by (1) volcanic eruptions, (2) geysers, or eruptions of boiling water and steam, occurring at regular or irregular intervals in certain volcanic districts, the column of water being sometimes shot up to a height of over 100 feet, (3) hot springs, which are found in many districts not now volcanic, (4) measurements in deep mines, which show that the temperature increases at the rate of about 1° F. for every fifty or sixty feet in depth.

RIVERS

25. The work of a river in modifying the surface of the earth is, broadly, to remove rock material from the upper part of its course and spread out this material partly in its lower valley (during floods) and partly on the floor of the sea near the mouth of the river.

In the upper mountainous part of a river the slope of the river-bed is steepest and the velocity of the water is therefore greatest. The water can move pebbles and gravel down its course, or even, during heavy floods, considerable boulders.

The river is continually deepening its bed and cutting out its banks. The effect, in ordinary cases, may be scarcely measurable in a century, but it should be remembered that the great majority of valleys have been produced from the beginning by rivers.

Rivers are thus most effective (in wearing away the land) near their sources. They tend not only to deepen their valleys, but to extend the valleys backwards—this is really a necessary result of the deepening. Hence a rapid stream on one side of a slope, aided by "weathering," may in time cut back its valley *through* the watershed, and "capture" streams on the other side which originally flowed in another direction. Thus it is supposed that a short rapid stream (*now* the lower Severn), flowing into the Bristol Channel, long ages ago wore back its valley until it "captured" or formed a new outlet for the upper Severn, which previously had flowed into the Thames. The upper valley of the Thames now appears much too large and wide for the small river flowing through it, and this is explained by the fact that the Thames lost its main source of water, the upper Severn. It is not uncommon, in England and other countries, to find small rivers flowing through wide flat valleys which have every appearance of having been formed by large rivers. Such cases are generally due to "river capture."

In the lower part of its course, where the river flows over a plain, the water, flowing down a much more gentle slope, has lost much of its velocity, and can only transport fine sand and mud. During floods this is deposited on the low ground near the river, and the soil so formed is called *alluvium*. Plains formed in this way by river-deposits are termed *alluvial plains*. They are generally very fertile.

Many slow-flowing rivers are gradually raising their beds by deposition of sediment brought down from the mountains. It is not uncommon on a low plain to find rivers whose beds are above the level of much of the surrounding country, as shown in Fig. 15. Such countries are very liable to disastrous floods unless the banks of the river are artificially strengthened. The Yellow River (Hwang Ho) in northern China has changed its course several times within the historical period, causing enormous loss of life each time. The Mississippi at New Orleans is from five to ten feet above the level of most of the city.

26. Rivers on a fairly flat plain also often change their courses, not suddenly or disastrously like the Yellow River, but slowly, by enlarging slight curves in their course. On the outer side of a curve the velocity of the water is greater than on the inner side. To this is due the fact that a river generally cuts away its bank on the outer side of a curve, and deposits sediment on the opposite side, where the bank is convex, and the flow of the water is checked. Thus any slight curve in the original course of the stream tends continually to increase (Fig. 16).

Look on a large-scale map of France at the extraordinary curves of the Seine below Paris. Look also at the curves of the lower Forth, above and below Stirling.

"From Stirling Castle we had seen
The *mazy* Forth unravelled."

Similar curves may often be seen in quite small streams.



Fig. 15. SECTION OF OLD VALLEY COVERED WITH ALLUVIAL SOIL.
VERTICAL SCALE EXAGGERATED.

DELTA

27. When a river enters the sea or a lake its current is suddenly checked, and the fine mud brought down by the water falls to the bottom. If there are no very strong tidal currents, the sediment accumulates till it rises to sea-level, and forms new alluvial land called a *delta*. The main river usually divides at the head of the delta, and reaches the sea through numerous branches called distributaries. These frequently expand into shallow lagoons before reaching the sea. When embanked to prevent flooding, deltas (like other alluvial plains) are generally very fertile and productive.

The name delta is derived from the Greek letter Δ (delta), because one of the most important deltas, and the one best known to the Greeks, that of the Nile, is roughly triangular in shape.

In tideless seas, such as the Mediterranean, deltas are continually growing. The delta of the Po has grown twenty miles eastward into the Mediterranean within historical times.

SAND-BANKS AND BARS

28. Rivers which enter tidal seas do not generally form deltas, but their mouths are very often obstructed by *sand-banks*, which sometimes make the entrance to the river difficult and dangerous, especially by often changing their position. For this reason ships approaching or leaving a seaport commonly have to take on board a pilot, who has special local knowledge of the channels.

Sometimes a *bar* of sand or pebbles, with only shallow water over it, extends right across the mouth of a river, and can only be crossed by ships at high tide.

There are in fact very few, even of the large rivers of the world, which in their natural state can be easily entered from the sea by the large ships of the present day. Where an important seaport lies on a river, the approach to it is carefully marked by buoys and light-ships, and in some cases the channel is continually being dredged to prevent it from silting up.

Many rivers, e.g. the Severn and the Thames, widen out considerably before reaching the open

sea, and it is often impossible to say definitely where the river ends and the sea begins. This wider part of the river is known as its *estuary*. At high tide the estuary is filled with salt water; at low tide great stretches of sand are often exposed, the river then flowing in a comparatively narrow channel, which sometimes changes its position.

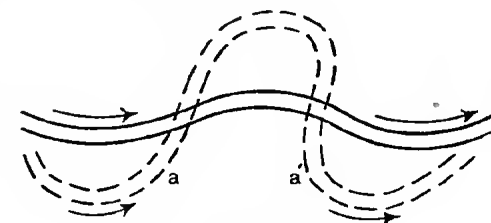


Fig. 16.
ORIGINAL COURSE OF STREAM —
LATER COURSE OF STREAM - - -

GLACIERS

29. A glacier is a slow-moving river of ice, descending a mountain valley at a rate varying from about one foot to about fifty feet a day. In temperate countries such as Switzerland the ice melts on reaching a certain level, and a river flows out at the base of the glacier. In the Arctic regions, however, the glaciers reach the sea. When the ice has been pushed out far enough into the sea, its own

weight breaks it off, and a great *iceberg* floats away, to be ultimately melted on reaching warmer water.

The surface of a glacier is generally by no means clean ice, but is more or less covered with rock fragments which have fallen from the surrounding slopes. These rocks accumulate especially along the edges of the glacier, forming low ridges called *lateral moraines* (Fig. 17). The bottom of the glacier also carries rocks down with it, and these are gradually ground up into sand and clay. Where the ice melts at the foot of a glacier, all the rock material brought down accumulates as a *terminal moraine*, a long mound of sand and clay, overlaid irregularly with pebbles and boulders. These moraines may be as much as 200 feet high. When, owing to some change of climate, a glacier has retreated or disappeared,

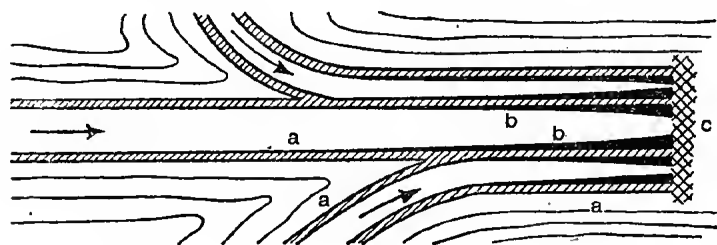


Fig. 17. A GLACIER AND TRIBUTARIES.

a a, lateral moraines; *b b*, medial moraines; *c*, terminal moraine;
—→ direction of flow; — - contour lines.

the terminal moraine has frequently acted as a dam across the valley, and so has caused a lake to be formed.

Morainic mounds are very common in England, particularly in North Wales and the Lake District.

The greatest glaciers in the world are in Central Asia, especially in the Pamir and Karakoram region.

"Born amid the howlings of the tempest and the roar of the avalanche, in inaccessible fastnesses far above the habitations of men or animals, and fed by large tributaries, themselves glaciers of the first order, these vast rivers of ice force their way downwards through the intervals between precipitous mountains for many miles into the deep valleys below, where, succumbing to the heat there encountered, they gradually die out and disappear. These great glaciers are not mere bands of snow and ice running smoothly from their

sources to their tongues, but they are most complicated structures descending in steep broken *ice-falls*, or thrown up into huge undulations, ridges, and high hillocks, seamed by unfathomable *crevasses*, and bearing on their surface or *within their substance* an incredible amount of *débris*." (W. H. Workman, *Geog. Journal*, Feb. 1910.)

THE ICE AGE

30. Though glaciers, outside the Arctic regions, are now found only in high mountains, there is abundant evidence that at some period many thousand years ago, a considerable part of North America and northern Europe (including the British Isles as far south as the Thames valley) had an Arctic climate and was covered with immense glaciers similar to those which now occupy nearly the whole of Greenland. This time is known as the "Ice Age" or the Glacial Period.

When the climate became warmer again, the ice-sheets of this period melted and left behind them a layer of very fertile soil known as *boulder-clay*. Large areas of this are found in North America, Europe, and eastern England, and this soil grows a considerable proportion of the world's crops of wheat.

COAST LINES

31. There is a great variety of coasts even in a small country like England. There are cliffs varying in height from 10 feet up to 1,000 feet, and of many colours from dark grey granite or red sandstone to white chalk; broad sandy beaches, generally with a bank of pebbles at their head; huge accumulations of boulders and shingle, as the Chesil Bank and Dungeness. Off some parts of the coast, *e.g.* Lancashire, miles of sand are exposed at low tide; in other parts there is deep water close to the shore at all states of the tide.

Long narrow inlets such as Milford Haven, the Norwegian fjords, the sea-lochs of western Scotland, and the long creeks of Essex and Suffolk are due to sinking of the land, which has enabled the sea to invade old river valleys. These inlets are often described as "drowned valleys."

When lowland valleys have been drowned, as in Essex, shallow sandy inlets, often almost dry at low water, have

been produced. But the drowning of mountain valleys, as in Norway and western Scotland, produces *fjords*, long, deep, steep-sided gulfs, which form magnificent natural harbours. Many fjords were formerly lakes, before the land had subsided sufficiently to connect them with the sea.

The wide, roughly semicircular bays which are so common along our coasts are due to the varying hardness and resistance of different rocks. The sea has scooped out the softer or less resistant materials, and left the harder rocks standing out as headlands separating one bay from another. Inland the hard rocks stand up as hills and mountains; on the coast the hard rocks stand out as headlands and cliffs.

SAND-DUNES

32. Sand from a dry beach is often blown by the wind above high-water mark. When thus removed from the action of salt water it soon becomes matted together by tufts of thin wiry grass, and forms low hills called *sand-dunes*. The dunes are an important protective barrier on many low coasts, particularly on the North Sea and the Baltic. Where there is a persistent on-shore wind, however, sand is sometimes blown a long distance inland, and in the south-west of France, in the district called the Landes, sand-dunes have destroyed a good deal of agricultural land. Their progress here has, however, been checked by the planting of pine trees.

CHANGES IN COAST LINES

33. There is evidence in many parts of the world of both sinking and elevation of the land. Old sea-beaches, coral reefs, and fossils of marine animals have been found on mountain slopes far above the sea. The bed of the North Sea was once dry land, and the Thames was then a tributary of the Rhine, while at other periods nearly the whole of England has been under water.

"There rolls the deep where grew the tree;
O Earth, what changes thou hast seen:
There where the long street roars, hath been
The stillness of the central sea."

Other changes in coast lines are due to the direct action of the sea, in washing shore material from one place and depositing it in another. The coast of Holderness (south-east

Yorkshire) has been washed away during the last two centuries at the rate of about seven feet a year. Spurn Head and Dungeness are examples of the constructive action of the sea, both being comparatively modern. Dungeness has been growing seawards for about three centuries at the rate of six feet a year. Some of the "Cinque Ports" of Sussex and Kent, which were very important ports in the Middle Ages, e.g. Romney, Sandwich, Rye, Winchelsea, are now inland towns.

ISLANDS

34. The islands of the world fall into two main classes—*Continental Islands* and *Oceanic Islands*.

(1) Continental islands are built up of rocks similar to those of the neighbouring mainland, from which they are generally separated only by shallow water. They were cut off from the mainland in times comparatively recent in the history of the world, and their animals and plants are, as a rule, very similar to those of the mainland. The British Isles are typical continental islands, being simply a detached continuation of western Europe. They stand on a submarine platform (the "continental shelf") covered with shallow water (less than 600 feet deep). This platform extends to a little beyond the west of Ireland, and there falls steeply to a depth of several thousand feet.

Madagascar and New Zealand are the only important examples of continental islands which are separated from the continents by a considerable expanse of deep water, and have plants and animals decidedly different from those of their respective mainlands.

35. (2) Oceanic islands are on the whole far smaller than continental islands. They are generally far from the continents, and rise abruptly out of deep water. Many thousands of these islands dot the surface of the western Pacific, and there are also many in the Indian Ocean and a few in the Atlantic. In the Pacific the islands appear crowded on an ordinary map, but their total area is only about equal to that of England and Wales, and the first explorer (Magellan) who sailed right across the Pacific from South America to Asia did so without sighting land.

The islands are of two main types—*volcanic* and *coral*; in the tropical seas the mountainous volcanic islands are almost everywhere fringed by coral reefs.

CORAL REEFS

36. *Coral limestone* consists of hard cells built by various species of organisms called reef-building corals, because they live in colonies and build continuous "reefs" or walls of coral. Reef-building corals flourish only in warm shallow salt water, down to a depth of about 100 feet. The water must have an average temperature of about 70° F., without great variations.

37. Coral reefs are of three types: the fringing reef, the barrier reef, and the atoll.

(1) The *fringing reef*, which grows close to the shore in quite shallow water. The corals live and build on the outside of the reef, where they can get more abundant food from the water. Hence the reef grows seaward, while the shore side of it, where there are no living corals, gradually gets worn and washed away, and ground down into coral sand.

(2) Thus the fringing reef gradually changes into the *barrier reef*, which lies at some distance from the shore, and encloses a lagoon of calm water. The *Great Barrier Reef* off the coast of Queensland is several hundred miles long, though there are numerous gaps in it. The chief gaps occur opposite the mouths of the rivers, as the water there is comparatively fresh, and corals thrive only in very salt water.

(3) An *atoll* is a roughly circular reef with one or more gaps, enclosing a lagoon with no land in the centre. Atolls may be several miles in diameter, but are seldom more than half a mile wide, and never more than 10 to 20 feet in height. There is thus a very strong contrast between these low islands, consisting wholly of coral limestone and sand, and the high volcanic islands, often rising to several thousand feet.

Atolls are often quite devoid of vegetation except coconut palms. When atolls are inhabited, the dwellings are always built on the inside of the reef, facing the lagoon, which is a natural harbour, though often with a very difficult entrance.



Will F. Taylor.

LAND'S END, CORNWALL.
Granite cliffs facing a stormy sea.

QUESTIONS ON CHAPTER III

1. Briefly describe, and account for, the formation of (i) an alluvial soil, (ii) an escarpment, (iii) an estuary, (iv) a valley.
2. (i) What is an alluvial plain? Why are such plains usually thickly populated?
(ii) What is a volcano? Name any very volcanic region either in Asia or in North America.
(iii) Which slope of the Cotswolds is the steeper? What is the steep slope of such a range of hills called?
3. What are the chief types of mountains? Give examples of each.
4. Explain the terms pass, watershed, moraine, geyser, delta.
5. Describe the ways in which rivers modify the surface of the earth.
6. Give an account of the different kinds of coral reefs, and say where they are chiefly found.
7. Describe the chief differences between continental and oceanic islands.
8. What are fjords, and how have they been formed?

CHAPTER IV

CLIMATE

GENERAL

38. The climate of a place is the average condition of the weather at that place, with regard to temperature, rainfall, sunshine, wind, etc.; that is, climate is concerned with the average physical condition of the *atmosphere*, or ocean of air which covers the whole earth.

Owing to its weight the atmosphere exerts *pressure* on the earth, which amounts at sea-level to nearly 15 pounds per square inch. The pressure of the air is measured by an instrument called a *barometer*, which is familiar to most people and is described in textbooks of physics. At sea-level the average height of the mercury in a barometer is nearly 30 inches, but it constantly changes. It is almost always, however, between 28 and 31 inches, being generally low in stormy weather and high in settled fine weather.

As we ascend to higher levels in the atmosphere, the pressure becomes less and the air becomes more rarefied or less dense, *i.e.* a given volume of it weighs less than the same volume of air at a lower level. Half of the whole atmosphere lies below a height of about 18,000 feet, and seven-eighths of it below 10 miles, but it is probable that air in a very rarefied state extends to a height of 200 miles.

At high levels, not only the pressure but the *temperature* of the air decreases, at the average rate of about 1° F. for every 300 feet of vertical height. This is because air is only very slightly warmed by the direct rays of the sun, but gets nearly all its heat by contact with the heated ground.

RAIN AND SNOW

39. Air always contains a small but very variable amount of *water vapour*, produced by *evaporation* from seas, lakes, rivers, and damp earth and plants. When air is sufficiently cooled, as, for instance, happens when it rises to a higher level, the process of *condensation* takes place, *i.e.* part of the water vapour is condensed into very small drops of liquid

water, which form a cloud, or, if they happen to be formed close to the earth's surface, a fog or mist.

The drops of water first formed are so small that, like dust, they remain suspended in the air for a long time. But under certain circumstances the drops increase in size, and gather sufficient weight to fall quickly; the result is rain, one of the most important elements of climate.

The rainfall of a place is measured by a *rain-gauge*. This consists of a funnel, which collects all the rain that falls on a definite area, usually a circle five or eight inches in diameter. Rainfall is stated in terms of the depth of water which would accumulate on a level surface if all the water stayed where it fell, without running off or sinking into the ground. Temperate countries generally have a rainfall of from 20 to 40 inches a year, but often more in mountainous districts. A rainfall of more than one inch in a day is somewhat rare in England (occurring perhaps two or three times a year), but is common in tropical countries. In some parts, indeed, 20 or even 30 inches of rain have been known to fall in a day.

When water-vapour is condensed at a temperature below the freezing-point (32° F.) it forms snow instead of rain. A snow-flake consists of a number of very small hexagonal crystals of ice, matted together. A snow-fall one foot in depth is about equal to one inch of rainfall. In Arctic countries and on high mountains all the water that falls is in the form of snow, not rain, and it produces glaciers instead of rivers.

Rain is often classified in three ways, according to the causes producing it. (1) *Convictional* rain, characteristic of tropical regions mainly, is simply due to a current of warm air (a "convection current") rising from the ground to cooler levels, like the current of air over a fire (Art. 40). (2) *Relief* rain is caused when a wind meets and ascends a mountain slope until condensation results. Thus Ben Nevis (4,000 feet) has an annual rainfall of about 160 inches, while eastern Scotland in the same latitude has only about 30 inches. Mountain ranges often have a very heavy rainfall on their windward slopes, while on the leeward side there is a "rain-shadow," or area of much smaller rainfall. (3) *Cyclonic* rain is caused by those irregular disturbances in the air called cyclones (Art. 47).

WINDS

40. Wind is air in motion. The winds are caused by differences of pressure in various parts of the air, and these are generally due to changes of temperature. When any part of the air increases in temperature it expands, and therefore, becoming less dense, tends to rise to a higher level. The pressure of the hot air becomes less than that of the surrounding atmosphere, and air is therefore driven in to equalise the pressure.

Around an open fire there is on all sides an in-draught of cold air, and above the fire a rising current of warm air. Very much the same thing takes place, on an immensely larger scale, all along the equatorial or hottest belt of the earth's surface.

Wind always blows from regions of high pressure to those of low pressure; but the actual direction of the wind is modified by the rotation of the earth. It has been proved that owing to this rotation: "*Any moving body on the earth's surface (including a current of air) tends to be deflected from its course, the deflection being to the right in the northern hemisphere, and to the left in the southern hemisphere.*" This is known as Buys-Ballot's law.

PERMANENT WINDS

41. Over the equatorial belt of the earth there is a perpetually rising current of warm moisture-laden air. This is a belt of permanent low pressure. About lat. 30° – 35° north and south there are belts of permanent high pressure, from which winds blow both towards the poles and towards the equator. Instead of blowing due north and south, however, as they would do if the earth were at rest, these winds are deflected in accordance with Buys-Ballot's law, and blow as represented in Fig. 18.

The result is a general movement of air towards the west in the torrid zone, and towards the east in the temperate zones. This has important effects on climate, making almost all eastern tropical coasts and western temperate coasts rainy, because on these coasts the prevailing wind is from the sea. The British Isles and most of Europe lie in the belt of "Westerly Variables," so called because, though the wind blows more from the west and south-west than from

any other quarter, its direction is by no means so constant as in the climatic belts further south.

42. The winds blowing from the tropics towards the equator have long been known as *trade winds*, or "the trades," because in the days of sailing-ships they were of great importance to navigation.

The belts of calms and variable winds about Lat. 30° north and south (the calms of Cancer and Capricorn) are known to sailors as the *horse latitudes*. There is also an equatorial belt of calms called the *doldrums*, where sailing-ships were frequently becalmed. It was dreaded by sailors on account of

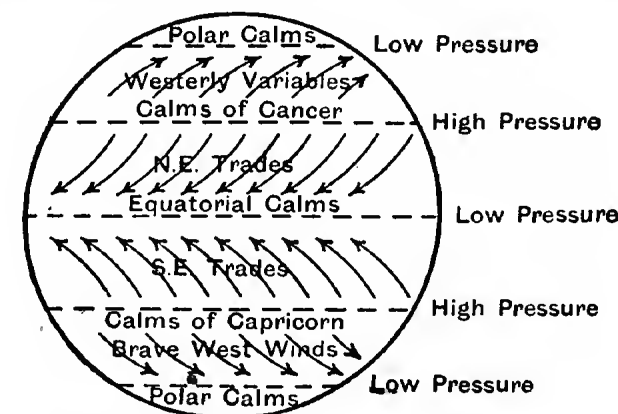


Fig. 18. PERMANENT WINDS AND CALMS.

its high temperature, frequent terrific thunderstorms, and deluges of rain.

The belt of "Brave West Winds" in the southern hemisphere is often called the *Roaring Forties* (lat. 40° – 50° S.) because of the strength and constancy of the winds. On account of these winds the passage in a sailing-ship from Cape Horn to Capetown, or from Capetown to New Zealand, is easy and rapid, but the return passage, going westward, is very slow and difficult.

The whole system of winds and calms above described moves north and south annually with the apparent movements of the sun, but only through a range of from 5° to 10° , whereas the sun moves through 47° . In the northern summer the "doldrums" lie a few degrees north of the

equator, and in the northern winter a few degrees south of it; and the other belts move in a corresponding way. Thus the "thermal equator" or belt of greatest heat is a moveable line, not a fixed one, as the geographical equator is.

In the Arctic and Antarctic regions there are strong and very cold winds (not shown in Fig. 18) blowing persistently from the polar regions, and thus opposing exploration towards the poles.

SEASONAL WINDS

43. Seasonal or periodic winds are chiefly due to the familiar fact that water varies far less in temperature than land does. The sea is generally cooler than the land in summer, but often warmer than the land in winter.

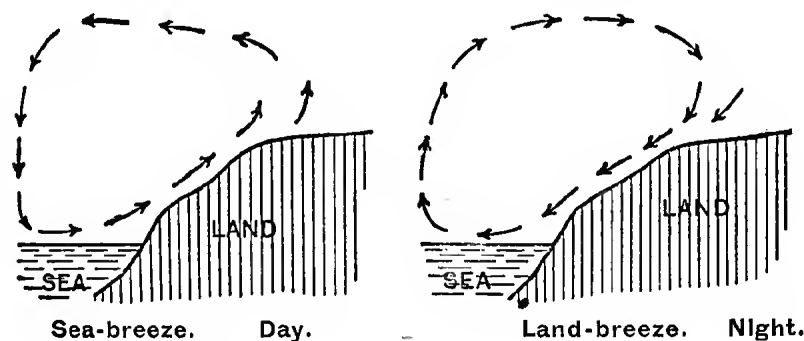


Fig. 19a.

Fig. 19b.

LAND AND SEA BREEZES

44. In calm hot weather at places near the sea there are often regular daily changes in the circulation of the air. During the day the land becomes hotter than the sea, and the air above the land rises, while cool air from the sea comes in to replace it (Fig. 19a). Thus a *sea-breeze* is established. At night, especially if the sky is cloudless, the land becomes colder than the sea, the movement of the air is reversed, and there is a *land-breeze* (Fig. 19b).

Land- and sea-breezes are strongest in the tropics on mountainous coasts, but may be observed on the English coast during fine summer weather. They may of course be concealed by some strong constant wind.

MONSOONS

45. Monsoons are really land- and sea-breezes on a large scale, but with a period of a year instead of a day. They prevail chiefly in south-eastern Asia, from India to China, and in north-eastern Australia.

In summer the plateaux of south-west Asia, just north of the tropic, become very hot, and form a centre of low pressure (lowest in Baluchistan, to the north-west of India), around and towards which winds blow, being deflected to the right by the earth's rotation (Art. 40). The effect is similar to that of a large stationary cyclone (Art. 47). Hence south-west winds blow from about May to September over the Arabian Sea and the Bay of Bengal to India.

This *summer monsoon*, meeting two high mountain barriers—the Western Ghats in southern India and the much higher Himalayas in the north—is forced upward into cooler regions, and, being heavily laden with moisture from the tropical sea, deposits a very heavy rainfall on the windward slopes of these mountains and on the plains lying at their feet.

In Indo-China and China the summer monsoon blows from the south and south-east, and also brings heavy rain to these regions.

In winter the plateaux of central Asia become a centre of intense cold and high pressure, with outflowing winds. The summer conditions are entirely reversed. The *winter monsoon* blows from the north-east in India and from the north and north-west in Indo-China and China. It is almost everywhere a dry wind, but in crossing the Bay of Bengal and the South China Sea it picks up enough water-vapour to produce abundant rainfall in the extreme south of India, in Ceylon, in the south of the Malay Peninsula, and in the adjacent islands. These regions close to the equator receive rain at all seasons, while further north the wet and dry seasons are very distinctly marked. In India, generally speaking, nine-tenths of the rain falls during four or five summer months.

The heaviest rainfall in the world, as far as is known, occurs on the Khasi Hills in Assam, some of the "foot-hills" of the Himalayas. The average annual rainfall is about 500 inches. Over 30 inches of rain (about the annual average for England) have been known to fall there on each of five successive days.

The combination of heavy rainfall with high temperature makes the monsoon countries perhaps the most productive in the world, and they are the most densely populated regions, except the manufacturing districts of Europe and North America.

THE WEATHER MAP

46. Most newspapers publish daily maps illustrating the weather of a large area at a given time on the preceding evening. These maps are based on the official map issued by the Meteorological Office of the Air Ministry, and the forecasts of weather issued with the map are clearly of great importance to airmen, sailors, fishermen, and, in harvest time, to farmers. Since it became possible to get weather information frequently from ships in the Atlantic by wireless, the weather forecasts have become much more accurate and detailed.

The most prominent features of such maps are *isobars*, which are lines of equal pressure, just as contours (Art. 15) are lines of equal height. The pressure of the air was formerly measured in terms of the height of the mercury column in a barometer, being expressed in inches in England and in millimetres on the Continent. A universal unit of pressure has now been adopted, and is called a *millibar*. The millibar is defined as a pressure of 1000 dynes per square centimetre. Only those who are studying physics will understand this definition, but it is quite sufficient to remember that the average pressure of air at sea-level is about 1000 millibars (commonly written mb.), and that the pressure at sea-level rarely goes below 970 mb. or above 1030 mb.

Just as on a contour map a number of contours near together indicate a steep slope, so on a weather map a number of isobars near together indicate a steep "barometric gradient," that is, a considerable variation in pressure within a short distance, resulting in strong winds or gales.

CYCLONES AND ANTICYCLONES

47. In the British Isles and in most of the north temperate zone the weather depends mainly on large eddies or whirls of air, which are of two distinct classes, cyclones and anticyclones.

A *cyclone* is a portion of the atmosphere in which the pressure is lowest in the centre and gradually increases outwards.

The winds blow in spiral curves around, and at the same time towards the centre, the direction of the wind in the northern hemisphere being in the opposite direction to that of the hands of a clock. The cyclone as a whole moves forward, generally (in our latitudes) towards the east or north-east.

Fig. 20 shows the general distribution of weather in a typical cyclone. A considerable number of such cyclones pass across the British Isles or near them, especially in winter, producing long periods of "unsettled" weather.

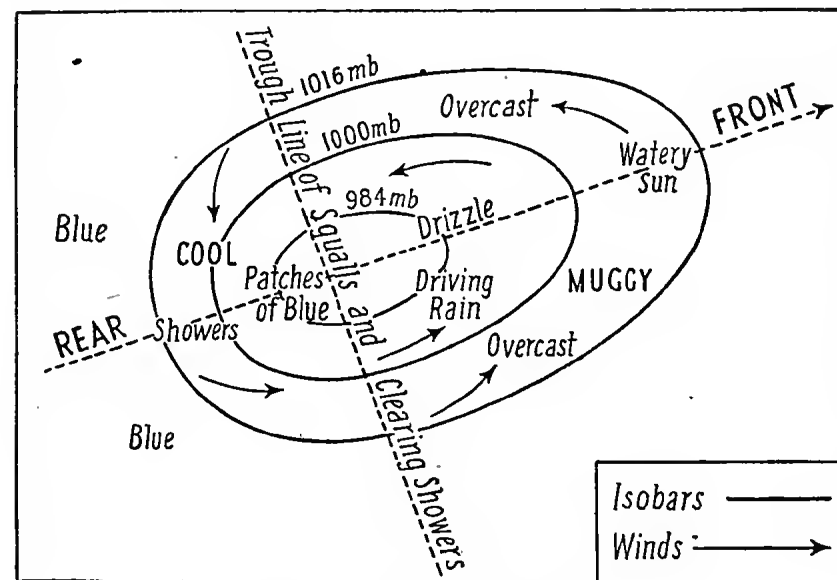


Fig. 20. CYCLONIC WEATHER.

From the fact that air is moving towards the centre of a cyclone, it is clear that in the centre the air must be rising. The ascent of this air to a cooler level produces rain; hence cyclonic weather is almost invariably rainy weather. The approach of a cyclone is marked by a rapidly falling barometer, a gloomy sky, and oppressive "muggy" air, followed by heavy rain. As soon as the centre of the storm has passed, the barometer begins to rise, the air feels much fresher, and patches of blue sky can often be seen, though there is often more rain in the rear of the storm. At sea the wind is usually strongest, and the sea roughest, in the rear of a cyclone.

An *anticyclone* is a portion of the air in which the pressure is highest in the middle and diminishes outwards. The winds, which are very much weaker than those of a cyclone, blow spirally outward, their direction in the northern hemisphere being the same as that of the hands of a clock.

An anticyclone often remains for several days nearly in the same position; to do this it must continually receive fresh supplies of air from above. This air gets warmer in descending, hence no clouds or rain are formed. Anticyclonic weather is calm and hot in summer, with clear skies and heavy dews; calm and cold in winter, with fogs in towns and over water.

The weather maps published in *The Times* or other newspapers should be carefully examined, with the accompanying explanations, during different kinds of weather, rainy and fine, summer and winter, stormy and calm.

STORMS

48. In temperate latitudes cyclones are generally of large size—several hundred miles across—and it is only rarely that the winds are strong enough to do much damage to buildings or even to shipping. The *hurricanes* of the West Indies and the *typhoons* of the China Seas are much smaller cyclones, in which the “barometric gradient” (*i.e.* the difference in pressure over a given distance) is very steep. These winds therefore are of terrific violence, and often do great damage both on land and at sea. Hurricanes and typhoons occur chiefly in the late summer and autumn. Twenty per cent. of typhoons occur in September, at the time of the changing of the monsoons.

The *tornadoes*, which occur occasionally in the south-eastern United States, are even more destructive than hurricanes, but fortunately cover a much more limited area. They not only destroy buildings, but fell large trees. At sea the pressure at the centre of a tornado may be so small as to suck up a column of water, forming a *waterspout*.

The *simoom* of the Sahara Desert is a small cyclone in which the wind is laden with sand.

LOCAL WINDS

49. Places on the leeward side of mountain ranges, particularly the northern valleys of the Alps and the eastern

valleys of the Rocky Mountains, have occasional hot and very dry winds, blowing down the valleys, and called *Föhn* winds in Switzerland and *Chinook* winds in America. Such winds (the explanation of which must be left to larger books) have important local effects on climate. They melt snow very rapidly, and in Switzerland help to ripen the grapes.

A very warm moist disagreeable wind from the south is known in Mediterranean countries as *Sirocco*. A cold north wind is called *Bora* in the Adriatic and *Mistral* in the Rhône valley.

FACTORS OF CLIMATE

50. The climate of a place depends chiefly on the following circumstances: (1) latitude, (2) elevation, (3) distance from the sea, (4) ocean currents, (5) prevailing winds, (6) land-relief, especially the position and direction of mountain chains.

LATITUDE

51. The latitude of a place determines its seasons and the duration of daylight at different times of the year. The difference in length between the longest and the shortest day increases with latitude (see Table, Art. 3). Hence, as a rule, the higher the latitude of a place, the greater will be the difference between summer and winter there.

The total duration of daylight for a year is the same in all parts of the earth, and amounts to slightly more than half the year; but generally speaking the further a place is from the equator the less is its average temperature. This is partly due to the fact that in high latitudes sunlight falls much more obliquely on the earth than it does between the tropics, where the sun at midday is always nearly or quite vertical, and therefore has a much greater heating effect.

At midsummer in England the midday sun is about 60° above the horizon, but in December its elevation is less than 20°. At the equator the midday sun may vary in elevation from 90° to, at the lowest, about 67°.

Another and more important reason for the coldness of the polar regions is that though they have sunlight for half the year they receive a much less total amount of heat than do the equatorial regions. This may be made clear by considering

Fig. 21, which represents half the earth *as seen from the sun*, i.e. heat-rays are supposed to be passing from the spectator into the figure, at right angles to it. The rectangles AB, CD, EF are equal in area, and therefore the same number of heat-rays will pass through them. The rectangles may be imagined as the ends of parallel flat tubes reaching from the sun to the earth. The portions of the earth's surface shown in dark shading are (on a sphere, though not in the drawing) *equal in area*.

Now of the total amount of heat passing through the tube EF, nearly the whole meets the earth and is absorbed by it. But of the heat passing through the tube AB much more than half (represented by the dotted shading) does not touch the

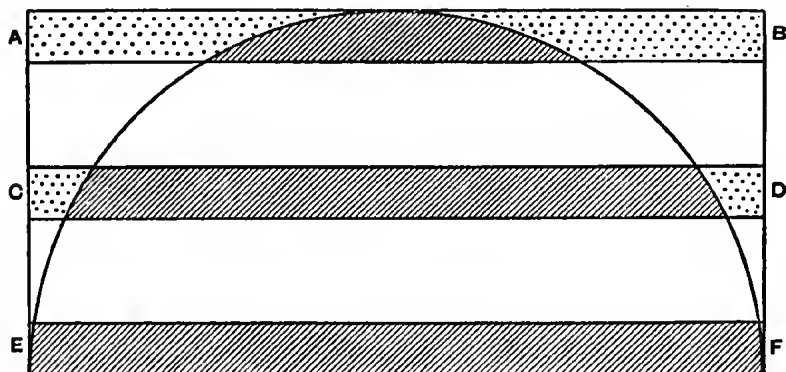


Fig. 21. EFFECT OF LATITUDE ON THE AMOUNT OF HEAT RECEIVED FROM THE SUN.

earth at all, but passes on into space, and, as far as the earth is concerned, is absolutely lost. The tube CD represents the case for intermediate latitudes, where the total heat received is less than in the equatorial belt, but considerably greater than in the polar regions.

ELEVATION

52. The influence of elevation on temperature has been already mentioned (Art. 38). High mountains in the tropics have all varieties of climate (and therefore of vegetation) from tropical to arctic. The *snow-line*, or line above which snow does not melt, is about 16,000 feet high at the equator, but only about 9,000 feet high in Switzerland.

The difference of temperature produced by elevation tends to be greater at night than in the day, greater in winter than in summer. The *average* difference is about 1° F. for every 300 feet. But the top of Snowdon on a hot summer noon is not 12° cooler than the lowland near it, while at night it is more than 12° colder.

Up to a certain level rainfall generally increases with elevation, because mountains force winds up to a cooler level where water condenses. In the British Isles the rainiest districts are around Snowdon, Scafell, and Ben Nevis.

DISTANCE FROM THE SEA

53. The sea has a great equalising effect on the temperature of places near it, making the winters warmer and the summers cooler than they are in the interior of continents. This is owing to the fact that water does not vary in temperature nearly so much as land does (Art. 43). Hence arises the distinction between *continental* climates, with a great difference between summer and winter, in places that are far from the sea, or shut off from it by high mountains; and *insular* or *oceanic* climates, with a much smaller range of temperature, in small islands, peninsulas, and coastal regions where the prevailing wind comes from the sea.

In Moscow and Winnipeg, and generally in the interior of the northern continents, the difference between the average temperatures of January and July is more than 50° ; while in such regions as British Columbia, Florida, and the south-west of England the difference is less than 20° ; in many tropical islands it is less than 5° .

OCEAN CURRENTS AND PREVAILING WINDS

54. Ocean currents only act indirectly on land climates by altering the temperature of the air which blows over them. The chief currents are dealt with in Chapter V.

55. The effect of winds on climate is closely connected both with the influence of the sea and with land relief. An on-shore wind generally produces a mild equable climate with abundant rainfall; off-shore winds produce a dry, cool climate.

LAND RELIEF

56. Mountain ranges produce very important differences of climate. When near the coast they act as barriers, preventing the moderating influence of the sea from spreading inland. This is especially marked, *e.g.* in Scandinavia (Chapter X.). The windward side of mountain ranges generally gets a heavy rainfall; the leeward side is often very dry. The influence of mountains extends, in both directions, a long way beyond their actual slopes. Thus the Himalayas produce heavy rainfall over the whole of the wide Ganges valley; and on the other hand a large part of central India has comparatively small rainfall, as it lies in the "rain-shadow" of the Western Ghats.

TYPES OF CLIMATE

EQUATORIAL BELT

57. The equatorial belt of calms is always hot and nearly always rainy. Thunderstorms occur almost daily, usually in the afternoon. As this belt of climate moves annually from about 5° N. to about 5° S. and back again, places within these limits have generally two wet seasons and two short dry seasons each year, the wet seasons occurring when the sun is vertically over them. The natural vegetation is chiefly dense tropical jungle, almost impossible to penetrate without cutting.

TRADE-WIND ZONES

58. The trade-winds, blowing constantly from cooler to warmer regions, pick up much moisture from the sea, and hence coasts which face eastward in the trade-wind zones have a heavy rainfall, and are generally densely forested—as in the East and West Indies, South America on both sides of the equator, south-east Africa, and eastern Australia. Summer is the rainy season in all these regions.

In blowing across the continents, however, the trade-winds become much warmer, and are hence capable of holding more water-vapour; they are therefore less liable to produce rain. Most of the great *deserts* of the world lie in the trade-wind zone—the Sahara, Persia and Arabia, western South Africa, central Australia, northern Chile (Atacama Desert), and the south-west of the United States, with the north of Mexico. The only large deserts which lie outside the trade-wind belts are those of central Asia, extending from the Caspian Sea to

the north of China; and these owe their dryness partly to the high mountains which surround them, and partly to their great distance from the sea.

MONSOON CLIMATES

59. In the *monsoon* region (India, Indo-China, China, and much of North Australia) there are three seasons in the year—a hot dry spring, a hot very rainy summer, and a cool dry winter. Owing to the long period of dry weather (seven or eight months a year), and the fact that the temperature is suitable for growing crops all the year round, irrigation, *i.e.* the artificial supply of water from rivers, canals, storage tanks, or wells, is specially important in monsoon countries, and is very highly developed in India.

MEDITERRANEAN CLIMATES

60. In the "horse latitudes," *i.e.* the outer margins of the trade-wind belts, occur the most important natural grass lands of the world—the *steppes* of south-eastern Russia and south-western Asia, the *prairies* of the middle United States, and the *pampas* of the Argentine Republic. These regions have on the whole a rather dry climate with a considerable range of temperature. They grow abundant grass in summer, but are nearly treeless except alongside rivers. Formerly devoted chiefly to pasturage, they are now becoming more and more agricultural.

Climates with moderately wet winters and almost entirely rainless summers—the most complete contrast, therefore, to monsoon climates—occur especially on the west side of continents in about latitude 30° to 40°. The rainless summer is due to the trade-winds; but in winter, owing to the movement of the belts of climate, these places are just within the influence of the westerly rain-bearing winds.

A climate of this type is called a *Mediterranean climate*, because it is the climate of most of the countries round the Mediterranean Sea. The same type of climate is found in California, central Chile, the extreme south-west of Cape Colony and of West Australia, and the south of South Australia. All these regions are in approximately the same latitudes.

East coasts in the warm temperate zones, just outside the tropics, have a climate of the "China" type, a sort of modified

monsoon climate, with warm rainy summers, and relatively dry, cool, or cold winters.

TEMPERATE CLIMATES

61. In the cool temperate zones there is a strong contrast between the mild oceanic climate of western coasts, and the "Laurentian" type of climate on the east, with warm summers but very cold winters. British Columbia has, on the coast, a climate very similar to that of the British Isles, but the mouth of the St. Lawrence, though farther south than London, is blocked by ice for four months every winter. There is the same contrast between western Europe and eastern Asia in the same latitudes.

The rainfall in temperate countries is fairly evenly distributed throughout the year. Western coasts have usually most rain in autumn and winter, but in the interior of the continents the rather scanty rain falls mainly in summer, and there is a very great difference between the winter and summer temperatures.

Places in the southern temperate zone are generally somewhat cooler than those in corresponding northern latitudes, and also have a smaller annual range of temperature.

Probably there was once an almost continuous belt of forest all round the world in the north temperate zone; but in the southern half of this area a large part of the forest has been cleared for agriculture. Deciduous trees—oak, elm, beech, birch, ash, and lime—are among the most important on low-lying ground, while further north and on mountain slopes coniferous trees—pines and firs—are more important.

ARCTIC CLIMATES

62. Places near the Arctic Circle, beyond the northern limits of the forests, have in summer a cool, damp climate, with frequent rain and fog. The ground is swampy, and, below a depth of a foot or so, is permanently frozen. Hence only dwarf plants can grow, as roots cannot penetrate deeply; grass, moss, and lichens are almost the only vegetation. These mossy marshes of the Arctic regions, frozen hard and covered with snow during the long dark winter, are known as *tundras*. The very scanty population lives by fishing, hunting, and collecting furs.



Valentin, Dundee.

GIANT'S CAUSEWAY, NORTHERN IRELAND.

This picture shows the six-sided (hexagonal) columns typical of basalt.

QUESTIONS ON CHAPTER IV

1. Describe and contrast a cyclone and an anticyclone.
2. Explain the terms monsoon, trade-winds.
3. (a) Account for the desert region of Australia; (b) explain the causes of the difference of the rainfall on the eastern and western coasts of Great Britain.
4. Cork, London, Dresden, and Kief are nearly in the same latitude. What are the differences of climate between these places, and how do you account for these differences?
5. What part of Canada is the most suitable on climatic grounds for settlers from the West of Ireland? Why has this part of Canada so different a climate from that of the rest of the Dominion?
6. Describe the characteristics of (a) a Mediterranean climate, (b) a monsoonal climate, and state in what parts of the world they are respectively found.
7. Explain the terms tornado, typhoon, simoom, land-breeze, chinook wind, sirocco.
8. At what part of the year would you expect the greatest and the least rainfall at Calcutta? Give reasons.
9. State and explain the position of the chief deserts of the globe.
10. Illustrate and explain the fact that, during winter, some places are much warmer than other places in the same latitude.
11. Say what effect (a) distance from the sea, (b) height above sea-level, (c) distance from the equator, have on temperature in summer and in winter. Illustrate by examples of places.
12. The following are climatic statistics for three towns, A, B, and C. Identify the type of climate to which each belongs, and give reasons for your answer.

	JANUARY TEMPERATURE	JULY TEMPERATURE	ANNUAL RAINFALL (INCHES)	WHEN RAIN FALLS
A	70° F.	54° F.	25	Chiefly May to October
B	45° F.	59° F.	56	At all seasons
C	80° F.	76° F.	98	All the year round

CHAPTER V

THE SEA

GENERAL

63. Nearly three-quarters of the earth's surface is covered with water. The greater part of the land area is in the northern hemisphere, as any map of the world shows at a glance. South of latitude 40° S. there is no land at all, except the narrow extremity of South America, New Zealand, Tasmania, and other smaller islands, and the almost unexplored "Antarctica," the continent which surrounds the South Pole. Thus between 40° S. and the Antarctic Circle there is an almost uninterrupted sheet of water all round the earth, connecting the Atlantic, Pacific, and Indian Oceans. This is called the *Southern Ocean*.

That half of the earth's surface which has its centre near Falmouth contains about seven-eighths of all the land; in this "land hemisphere" sea and land are nearly equal in area. In the "water hemisphere," which has its centre near New Zealand, the area of the land is less than one-tenth of that of the water.

The central position of England in the land area of the world is of considerable importance in promoting the commercial prosperity of this country, especially in that important branch of commerce called the *entrepôt* trade, which consists of importing from other countries goods which are afterwards to be re-exported—just as a shop-keeper collects goods from all quarters in order to distribute them to his customers.

THE OCEANS

64. The oceans form one connected sheet of water, but it is convenient to divide this into four parts—the Southern Ocean, above mentioned, and the *Atlantic*, *Pacific*, and *Indian* Oceans, which extend northwards from it.

The *Arctic*, which was formerly regarded as a separate ocean, is now generally called a partially enclosed sea of the Atlantic, with which it is connected by a wide opening, while its connection with the Pacific (Bering Strait) is quite narrow.

A submarine ridge, the Wyville-Thompson Ridge, covered with fairly shallow water, joins the north of the British Isles to Greenland, and thus separates the deep waters of the North Atlantic from those of the Greenland Sea. Iceland and the Faroe Islands are the higher parts of this ridge.

Most of the large rivers of the world flow into the *Atlantic* or its connected seas and bays. In fact, the Atlantic, including the Arctic, receives the drainage of more than half the land of the world.

The average depth of the ocean is about 11,500 feet, which is five times the average height of land (Fig. 22). Thus there is much more than enough room in the ocean to bury all the continents. The average level of the *solid* globe is nearly 10,000 feet below sea-level; hence if the oceans disappeared the continents would stand out as high plateaus separated by wide plains. On the whole the slopes of the sea floor are much less steep than those of the exposed land surface. The greatest ocean depth so far measured is over 34,000 feet, near the Philippine Islands in the western Pacific. This depth is more than 5,000 feet greater than the height of the highest mountain (Everest). The deepest parts of the ocean are generally found near lines of active volcanoes.

Sea-water contains on an average about three and a half per cent. of dissolved solids, chiefly common salt. Owing to the salts it holds in solution, sea-water is denser than fresh water, and freezes at a lower temperature, about 28° F., *i.e.* 4° F. below the freezing-point of pure water. In nearly enclosed warm seas like the Mediterranean and the Red Sea the proportion of salt is higher than the average, while in the Arctic and Antarctic seas it is lower.

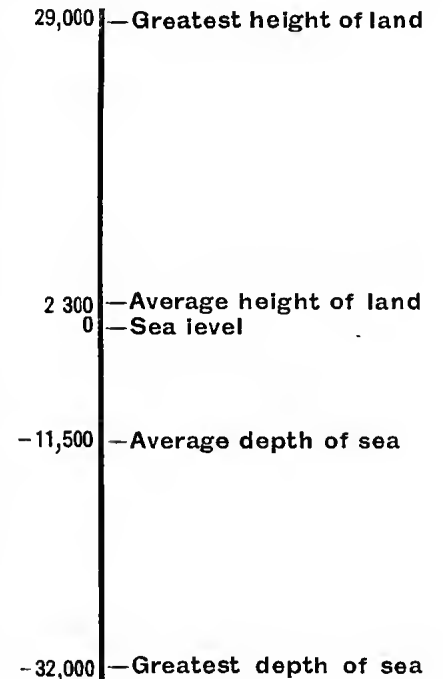


Fig. 22.

OCEAN CURRENTS

65. Differences of temperature in water cause differences of density, which tend to set up movements called "convection currents." Thus a piece of ice placed floating at one side of a dish of water will produce a slow circulation of the water: a stream of cold water will fall to the bottom beneath the ice (cold water being denser than warm), and will then flow along the bottom, rising on the other side, and flowing back along the top. The effect is greatly increased by warming one side of a dish of water, while the other side is kept cool by ice or in some other way.

Something of the same kind takes place in the oceans. Dense cold water settles to the bottom in the polar seas and flows along the bottom towards the equator, where it rises, gradually getting warm, and flowing again towards the poles. This movement is, however, very slow, and the actual surface currents of the ocean, which do not penetrate to any great depth, are mainly due to the prevailing winds, which produce a *drift* of the surface water in the same direction as the wind.

Roughly, the circulation of the surface water in the Atlantic, Pacific, and Indian Oceans takes the form, in each case, of two great eddies of water, one north and the other south of the equator; the northern one being in the same direction as the hands of a clock and the southern one in the opposite direction (compare Figs. 23, 24, 25); for ocean currents, like winds, are subject to Buys-Ballot's Law (Art. 40), *i.e.* they tend to turn to the right in the northern hemisphere, and to the left in the southern hemisphere. In the Southern Ocean, under the influence of the Brave West Winds (Art. 42), there is a continual eastward drift of water all round the world.

In shallow seas, such as the North Sea, tides (Arts. 71-3) control the circulation of the water to a large extent.

CURRENTS OF THE ATLANTIC

66. Study carefully Fig. 23 in connection with the following. The two westward currents north and south of the equator are caused by the trade-winds which blow persistently from the east. Between them flows a counter-current, which, after flowing round the Gulf of Guinea, merges again into the South Equatorial. The latter, meeting the coast of South

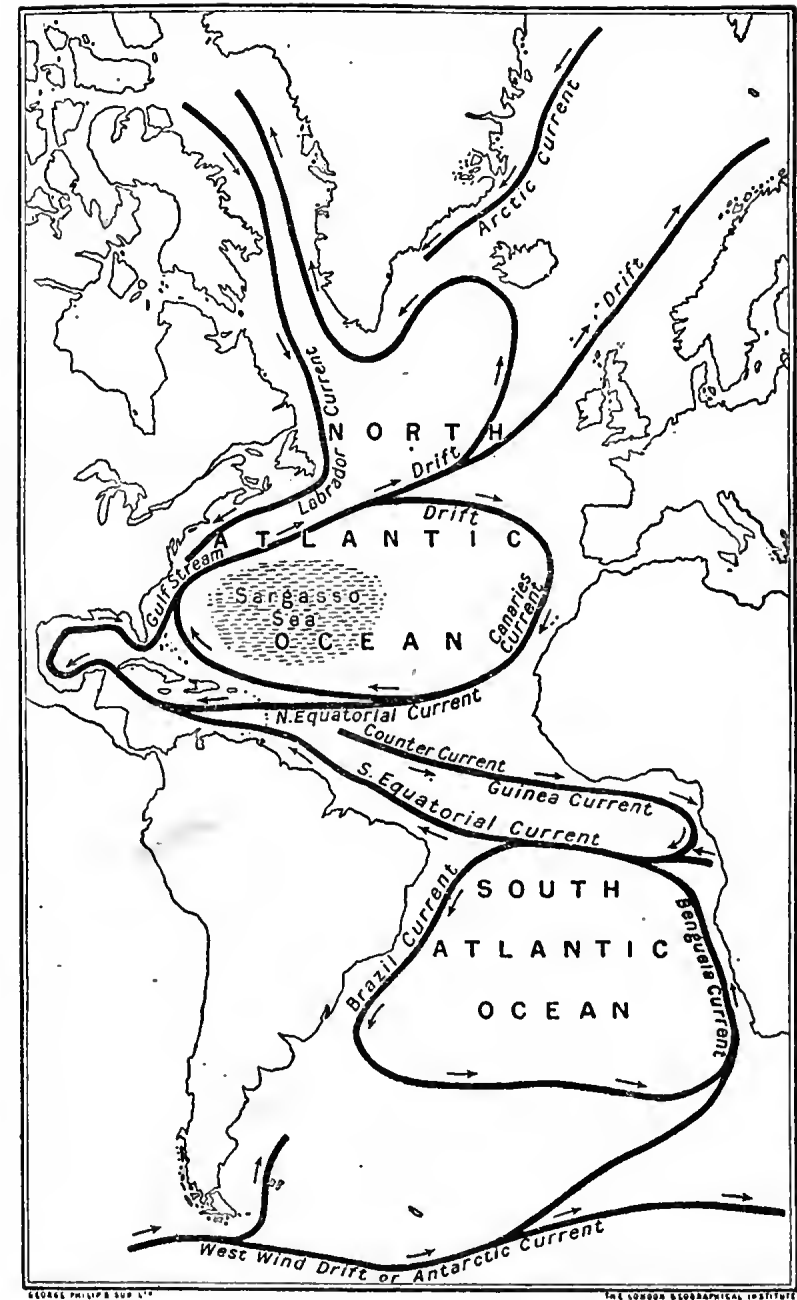


Fig. 23. CURRENTS OF THE ATLANTIC OCEAN.

America, is divided into two parts. The warm *Brazil Current* flows south to the Rio de la Plata, and is then driven across the ocean by west winds to near the Cape of Good Hope. From here, joined by a branch of the cold Antarctic Current further south, the *Benguella Current* flows northwards along the west coast of South Africa, and makes that coast distinctly cooler than the east coast.

The other parts of the South Equatorial Current, passing the mouths of the Amazon and Orinoco, joins the main part of the North Equatorial, and flows through the Caribbean Sea and into the Gulf of Mexico. The current emerges from the Gulf through the Straits of Florida as the *Gulf Stream*, one of the most clearly marked of ocean currents, a deep wide river of warm water flowing at the rate of about five miles an hour.

The Gulf Stream flows parallel to the east coast of the United States, becoming wider, shallower, and cooler, till it disappears altogether as a definite current. Far beyond the limits of the Gulf Stream, however, the prevailing south-west winds are continually drifting warm surface water across the North Atlantic towards the shores of Europe. This is sometimes called the *Gulf Stream Drift*, but should be carefully distinguished from the Gulf Stream itself, which only exists as a definite current off the south-eastern United States. The popular idea that England is warmed by the Gulf Stream is quite erroneous. It is true, however, that the general North Atlantic Drift helps to give both the British Isles and Norway exceptionally mild winters, less severe than those of almost any other part of the earth in the same latitudes.

67. The most important cold current of the Atlantic is the *Labrador Current*, flowing out of Baffin Bay along the Labrador coast, and carrying many icebergs. It flows round Newfoundland and along the north-east coast of the United States, where it is known as the "Cold Wall." It reaches about as far south as Cape Hatteras. This cold current partly accounts for the extremely severe winters of eastern Canada and the Northern States. It also produces the fogs for which Newfoundland is famous, while its icebergs are often dangerous to shipping.

The *Sargasso Sea* is a large area in the western North Atlantic, where there is comparative rest, and where immense

quantities of floating sea-weed (*Sargassum*) accumulate. Columbus sailed through the Sargasso Sea on his first voyage to America, but it is now outside ordinary steamship routes. It is a large oval area south of Bermuda.

CURRENTS OF THE PACIFIC OCEAN

68. These currents are very similar to those of the Atlantic. Notice in Fig. 24 the two equatorial currents with a counter-current between them; the warm *Kuro Siwo* (= black stream) or Japan Current, corresponding to the Gulf Stream; the west wind drift across the North Pacific, giving to British Columbia mild winters similar to those of the British Isles. In the southern hemisphere notice the warm East Australian Current, corresponding to the Brazil Current; and the cold *Humboldt Current*, which makes the western side of South America perceptibly cooler than the eastern side, just as the Benguella Current acts in the case of Africa.

The Galapagos Islands, which lie in the track of the Peru Current (the continuation of the Humboldt Current), are the coolest equatorial lowlands in the world.

CURRENTS OF THE INDIAN OCEAN

69. South of the equator the circulation of water in the Indian Ocean (Fig. 25) is similar to that in the Atlantic and Pacific. A cold current flows along the west coast of Australia, corresponding to the Benguella and Humboldt Currents. A warm current, corresponding to the Brazil and East Australian Currents, flows along the east coast of South Africa between Madagascar and the mainland, and is called the *Mozambique Current*.

In the northern Indian Ocean, which is almost divided into two by the peninsula of India, the circulation of the water is determined chiefly by the direction of the monsoon winds (Art. 45). In summer, when the south-west monsoon is blowing, the general movement is in the same direction as that of the hands of a clock, as in the case of the other oceans. In winter the north-east monsoon largely reverses this circulation. Complications are introduced into the currents of the Indian Ocean by the existence of numerous passages through the Malay Archipelago connecting the Indian with the Pacific Ocean.

THE MEDITERRANEAN AND BALTIC SEAS

70. The water of the Mediterranean is much more salt than that of the open oceans. It is in a hot and rather dry climate where evaporation is very rapid, and the water brought in by rivers is not sufficient to make up for this evaporation. Hence a continual current of fresher water flows in through the Strait of Gibraltar, and a similar

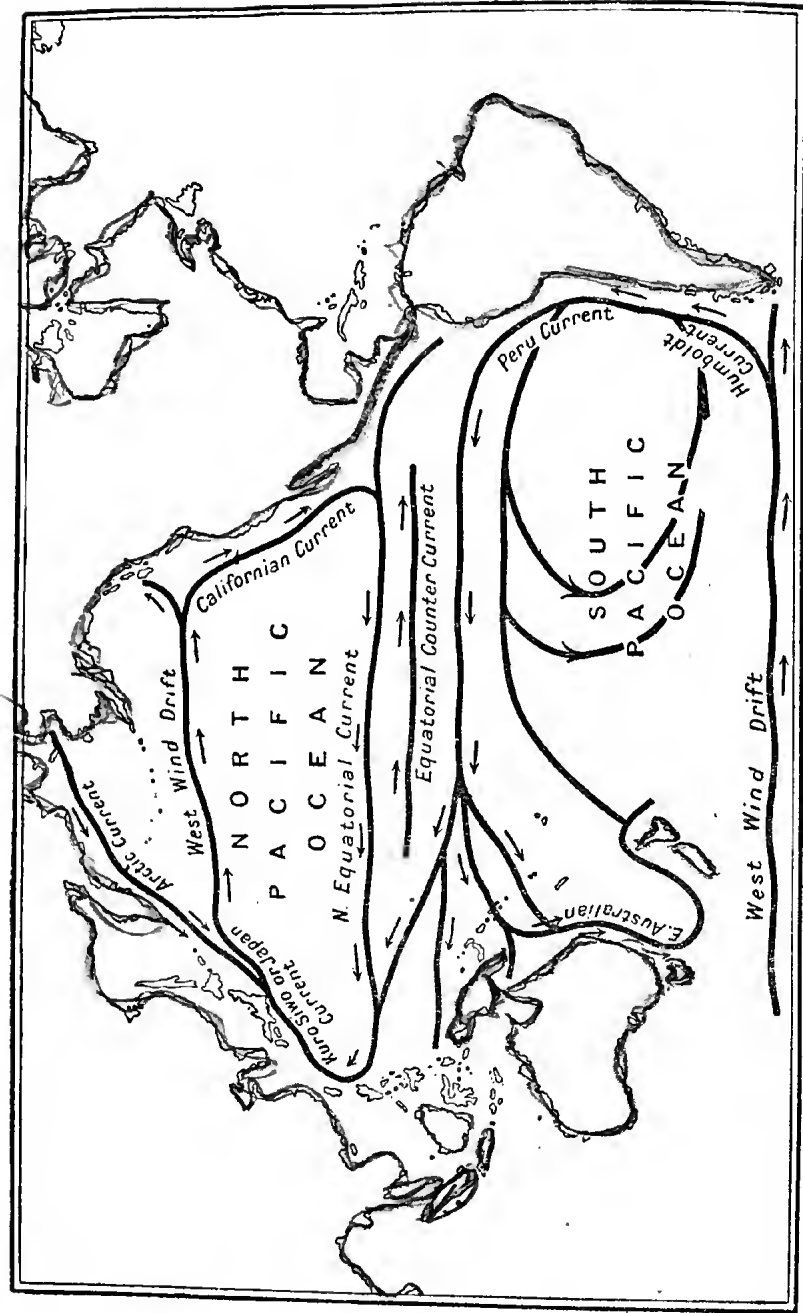


Fig. 24. CURRENTS OF THE PACIFIC OCEAN.

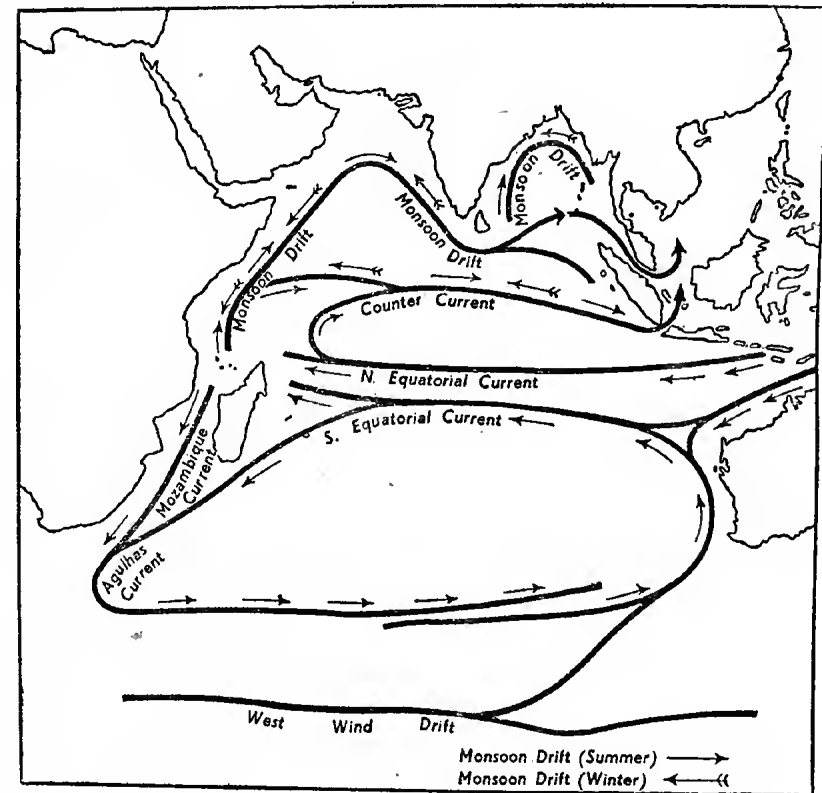


Fig. 25. CURRENTS OF THE INDIAN OCEAN.

current from the Black Sea flows in through the Dardanelles. In both places there is also, at a lower level, an outflowing current of dense very salt water, but this is of less volume than the inflowing current.

The circulation of water in the Red Sea is exactly similar to that of the Mediterranean, except that the Red Sea has only one entrance instead of two.

The Baltic Sea is in this, as in many other respects, a strong contrast to the Mediterranean. The Baltic receives so many large rivers, and is in a region where evaporation is so slow, that its surface water is comparatively fresh. The rivers much more than make up for evaporation, and there is an outflowing surface current of brackish water into the North Sea, with a smaller inflowing current of salt water underneath it.

The comparative freshness of the water accounts for the readiness with which the Baltic freezes in winter. The freezing-point of water is lowered by the presence of salt, in proportion to the amount of salt; and if the Baltic were as salt as the Mediterranean it would probably never freeze, and certainly would not be frozen for so long.

TIDES

71. The tides are waves produced chiefly by the attraction of the moon on the earth, due to the mysterious force known as "gravity." The result is to heap up, as it were, the water of the ocean in two waves on opposite sides of the earth, while midway between these are troughs or spaces of low water. This double wave follows the apparent movement of the moon round the earth once in about 25 hours, so that at every place high and low water succeed each other at intervals of about $6\frac{1}{4}$ hours; or each high tide is about $12\frac{1}{2}$ hours after the last.

The sun has a tide-raising effect similar to that of the moon, but much smaller, owing to the immensely greater distance of the sun. The tide-raising effect of the sun is a little less than half that of the moon. Hence the solar tides do not exist independently, but either increase or diminish the lunar tides, according to the relative positions of the earth, moon, and sun. It is only in connection with tides that the moon has any important effect on the earth. In every other respect the sun's influence on the earth is almost infinitely greater than that of the moon.

When the moon is either "new" or "full," the sun, moon, and earth are nearly in a straight line. The solar and the lunar tides then reinforce each other, and the "tidal range," or difference in level between high and low water, is greater than the average. These unusually high tides, occurring about once a fortnight, are known as *spring tides*.

About a week after the spring tides, when its first or third quarter (*i.e.* shows as a "half-moon") are often attractions of the sun and moon act on the earth in directions, which are at right angles to each other. The result is to produce tides of less than average height, which are known as *neap tides*.

The following table shows the remarkable differences in the height of the tide which may be produced by local circumstances, even in places situated, like Dover and Yarmouth, on the open sea. The last column of the table gives the time of high water at the respective places on a day when high water at London Bridge occurs at noon.

	SPRING TIDES Ft.	NEAP TIDES Ft.	TIME	
			h.	m.
Greenock	10	8	10	29 a.m.
Liverpool	27	20	9	37 a.m.
Avonmouth	40	31	5	22 p.m.
Southampton	13	9	8	38 a.m.
Dover	19	15	9	9 a.m.
Greenwich	20	17	11	45 a.m.
Yarmouth.. .. .	6	4	7	10 a.m.
Hull	21	16	4	32 p.m.
Aberdeen	12	10	11	10 a.m.

72. On the open oceans the tidal range is very small, only two or three feet, and no currents are produced, the movement of the water being merely up and down. In nearly enclosed seas with narrow openings, such as the Mediterranean, there is hardly any tide at all—a few inches, perhaps.

But in shallow partly enclosed seas, and especially round the British Isles, tides produce definite currents of considerable importance. The effect of the passage of a wave from deep water to shallow water is to increase its "amplitude" or height, and at the same time to diminish its speed. On the open ocean a tidal wave* moves round the earth in

* It is important to remember that a tidal wave is *not* a current. A stone dropped into a pond near a floating cork forms waves which merely produce an up and down motion of the cork, but do not displace it horizontally. The whole subject of waves is full of difficulties, which cannot be properly dealt with here. It is only near land, and in shallow water, that a wave changes into a current.

about twenty-five hours; but it takes six hours to traverse the English Channel.

The Atlantic tidal wave, on reaching the west of Ireland, flows round both ends of that island, and currents moving from two to four miles an hour sweep into the Irish Sea from both north and south, while another portion of the Atlantic wave advances eastward up the English Channel, increasing in height owing to the lessening width of the Channel.

"High water," *i.e.* the crest of the tidal wave, reaches Dover about six hours after passing Land's End, and at the same time the crests of the two tidal waves in the Irish Sea meet off the mouth of the Mersey. Thus Dover and Liverpool have high water at the same time.

While the tide is rising at these two ports, the Atlantic wave rounds the north of Scotland, and produces a southward current in the North Sea. The North Sea wave takes more than twelve hours in passing along the eastern shores of Great Britain, and it meets the next following high tide near the Straits of Dover.

When the tide is falling at Dover and at Liverpool the above-mentioned currents are approximately reversed.

73. Tides reach their greatest height in funnel-shaped bays and estuaries, where the water, as it advances, is compressed into an ever-narrowing channel. The greatest tidal range known is in the Bay of Fundy, Nova Scotia, where spring tides rise to a height of seventy feet. The highest tides in Britain are in the Bristol Channel, where spring tides have a range of about forty feet at the mouth of the Bristol Avon.

The tidal current advances far up the Severn, Trent, and a few other rivers as a distinct wave, with a front from one to three feet high, moving with great velocity. This is generally known as a *bore*. It is naturally most marked during spring tides. In most rivers, however, the rise of the tide is quite gradual, and the exact time when it begins cannot be determined by the eye.

Where a narrow entrance leads into a bottle-shaped opening, as in the Mersey and at Portsmouth Harbour, the large amount of water which has to pour through the neck to fill the inner basin flows with considerable speed, and the strong current through the neck of the bottle tends to sweep it clear of sediment, and so to keep a channel open.

Very rapid and complicated tidal currents are often produced among groups of islands, or through narrow straits, by differences in the time of high water on opposite sides of the opening. In the Pentland Firth the currents run at the rate of from six to eight miles an hour. Such a rapid current is called a "tidal race."

Southampton has the remarkable advantage of having four tides a day, instead of the usual two. It receives one tide by way of the Solent, and another, about two hours later, round the other end of the Isle of Wight, by way of Spithead. Both tides are branches from the main tidal wave advancing up the English Channel.

QUESTIONS ON CHAPTER V

1. Give an account of the causes of ocean currents, and draw a sketch-map showing the currents of the South Atlantic.
2. Write brief notes on: the Sargasso Sea, the Humboldt Current, the Labrador Current.
3. If you were staying at the seaside for a month, what differences would you notice from day to day (*a*) in the time of high tide, (*b*) in the height of the water at high tide? Explain.
4. What ocean currents affect North America, and in what manner?
5. Account for the great tides in the Bristol Channel.
6. What is the Severn "bore," and how is it accounted for?
7. Explain the term "Spring Tide."
8. What do you know about the tides of the Bay of Fundy, Southampton, the Mediterranean Sea?

CHAPTER VI

THE BRITISH ISLES

GENERAL

74. The British Isles consist of two large islands, Great Britain and Ireland, and many smaller islands. The total area is 121,000 square miles, of which nearly half (58,000) is in England and Wales.

The seas surrounding the British Isles are everywhere shallow—less than 100 fathoms (600 feet) deep. Nearly the whole of the North Sea is less than 200 feet deep, and the great fishing-ground called the **Dogger Bank** rises to within 60 feet of the surface. A narrow strip of the Irish Sea, from St. George's Channel to the North Channel, has a depth of 500 feet, and the sea between the Outer Hebrides and Scotland also reaches this depth. About 100 miles to the west of Ireland and Scotland the sea-floor sinks rather steeply from 600 feet to more than 3,000 feet deep.

Thus the British Isles rise from a nearly level platform now covered with shallow water. This platform, called the **Continental Shelf**, was dry land many thousands of years ago, and Britain then formed part of the continent of Europe. A slight sinking of the land then brought the lower parts of the continental shelf below sea-level, and formed our present islands, the outline of which has, however, changed slightly even during historic times.

The British Isles are typical *continental islands*, as distinguished from *oceanic islands*, such as those of the Pacific Ocean, which have never formed part of a continent, and are very unlike the continents. But our islands are simply detached pieces of Europe. The Scottish Highlands resemble Norway; our Fenland is like Holland; the white cliffs of Dover are paralleled on the French shore; the Weald is continued in France; Cornwall and Brittany are very much alike. Furthermore, our animals and plants are the same as those of Europe, though some European animals (*e.g.* bear, wolf, chamois) either never reached our islands, or have been exterminated.

COASTS

75. A glance at a map shows that our eastern coasts, both in Great Britain and in Ireland, are much smoother and less indented than the western coasts. Also the *east* coast is, generally, *low* and *rises gradually* from the sea. Where there are any cliffs at all, they are of no great height. The *west* coast, on the other hand, is generally *high* and *rocky*. Cliffs, often rising almost vertically several hundred feet, extend for many miles, particularly in Scotland, North Wales, Devon and Cornwall, and the west of Ireland. There are, of course, exceptions to these general statements. **Flamborough Head** in Yorkshire is one of the boldest headlands in the country, while the coast of Lancashire is very low and sandy.

The general contrast between the east and west coasts is due (1) to the fact that the west of the islands is much more mountainous than the east, and consists of older, harder rocks, which, under the long-continued action of wind and water, "weather" into bolder forms than the more recent and softer rocks of the east; (2) to the fact that nearly all our storms come from the west, and that therefore the power of the sea is greater on that side than on the east.

76. Numerous changes in coast-lines have taken place even within historical times. The coast of **Holderness**, in south Yorkshire, is being washed away at the rate of about seven feet a year, while the shingle cape of **Dungeness** has been growing seawards for three centuries at the rate of six feet a year. The river Yare, which once entered the sea at Yarmouth, was diverted by the formation of a sand-bar, and its mouth is now three miles further south. Sandwich and Rye, in Kent, were seaports in Roman times, but are now inland towns.

The chalk cliffs, from which Britain was once named "Albion," extend along only a small portion of the coast—**Flamborough Head**, part of Norfolk near Cromer, the Isle of Thanet, the end of the North Downs (Deal to Folkestone), the end of the South Downs (Beachy Head), and the south of the Isle of Wight.

Two of the most remarkable coast features of the British Isles are due to ancient volcanic action. Cooled lava forms a rock called basalt, which sometimes, in shrinking as it cools,

splits into six-sided columns. Great masses of these basalt columns are found at Giant's Causeway in the north of Ireland and at Fingal's Cave in the island of Staffa, in the Inner Hebrides.

LAND RELIEF

A. GREAT BRITAIN

77. Broadly, the north and west of Great Britain are mountainous, the south and east lowland. There are six considerable areas of uplands, viz. (1) the Scottish Highlands, the largest and highest of all, (2) the Southern Uplands of Scotland, (3) the Pennine Chain, (4) the Cumbrian Mountains, (5) Wales, (6) the Devon-Cornwall* peninsula, containing the separate uplands of Exmoor, Dartmoor, and several smaller Cornish Moors. Numbers 2, 3, and 4 of these, though quite distinct in character, are connected with each other by high land.

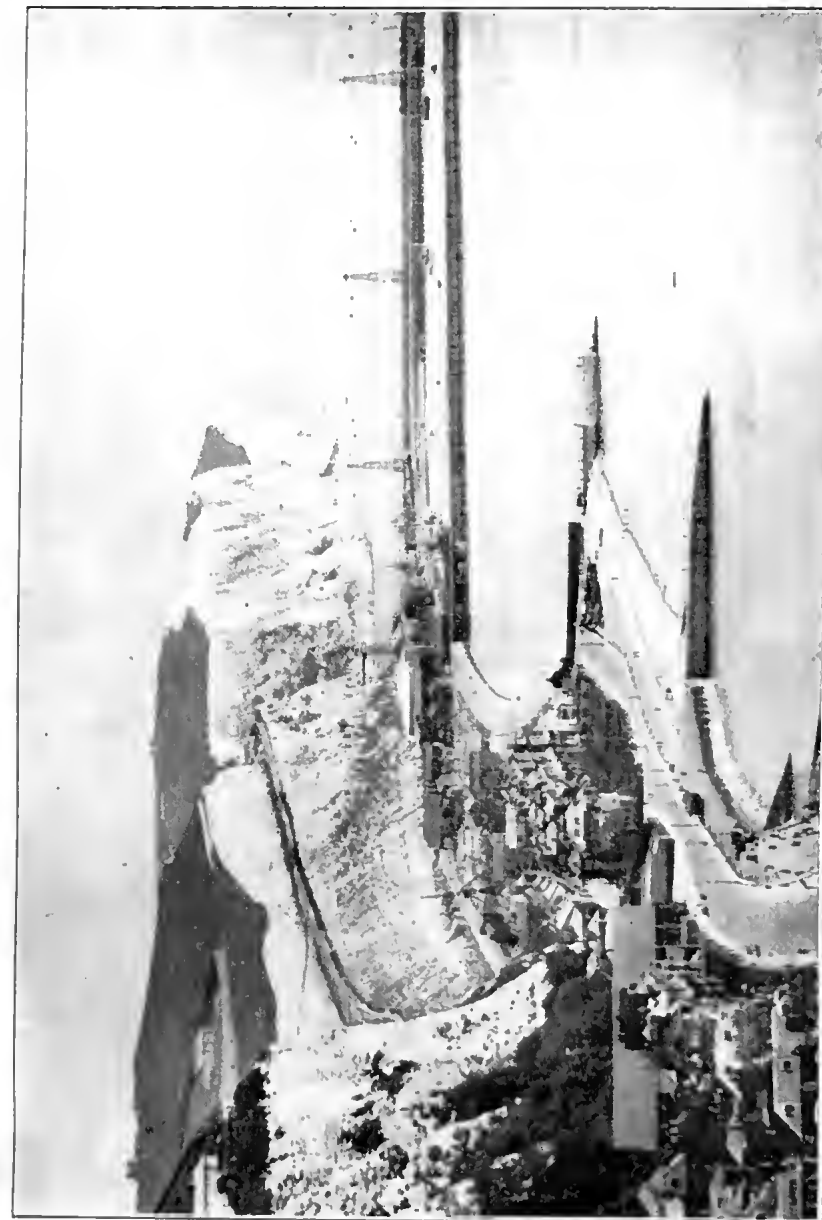
Figure 26 shows all the above areas except the Scottish Highlands, the land above 600 feet in height being shown in black. The figure illustrates the striking contrast in land-relief between the south and east of England and the west and north.

All the above-named uplands lie to the north-west of a line drawn from Start Point to Flamborough Head. On the south-east of this line, though there are many uplands, they do not cover large areas, and they are much lower than the mountains of the west.

78. In this south-Eastern region we can distinguish (Fig. 27)—

(1) A broken line of limestone hills extending from Lyme Bay to the mouth of the Tees. The most important parts of it are the *Cotswold Hills*, *Edgehill*, the *Northampton Heights*, and the *North York Moors* or *Cleveland Hills*. The steeper side of all these hills faces the north-west. Where a line of hills like the above has a steep slope on one side, and a gentle one on the other, the steep slope is called a scarp or escarpment. The term was originally used of the steep slope in fortifications.

* This name, though generally used, is not strictly accurate, as the peninsula includes West Somerset.



DOVER.

Notice (a) the artificial harbour, (b) the high chalk cliffs, (c) the absence of hedges and trees on the chalk downland, (d) the way the road winds round the cliff to the top.

E. O. Hooper.

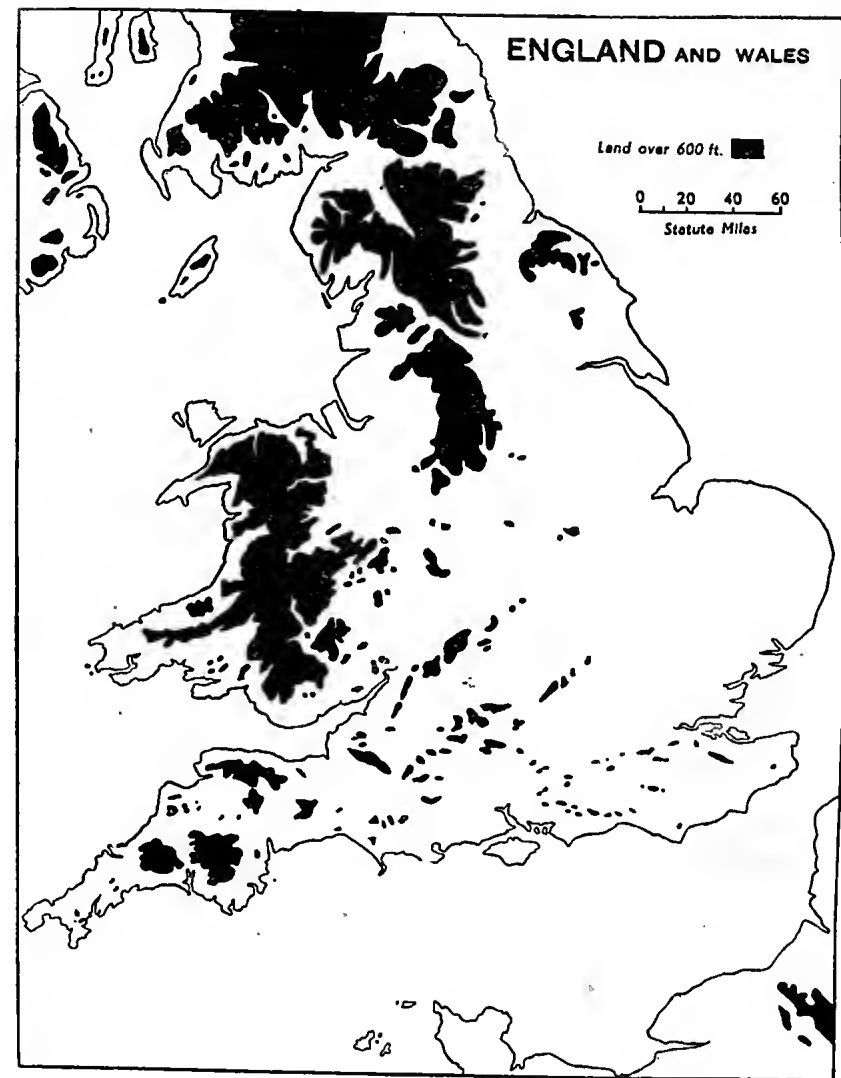


Fig. 26.

(2) A broken line of chalk hills extending from Weymouth to Flamborough Head, and including the *Dorset Downs*, *Salisbury Plain* (really a plateau), the *Marlborough Downs*, *Chiltern Hills*, *East Anglian Heights*, and *Lincoln and Yorkshire Wolds*. Salisbury Plain adjoins the *Hampshire Downs*, and from the latter two narrow lines of chalk hills extend eastward

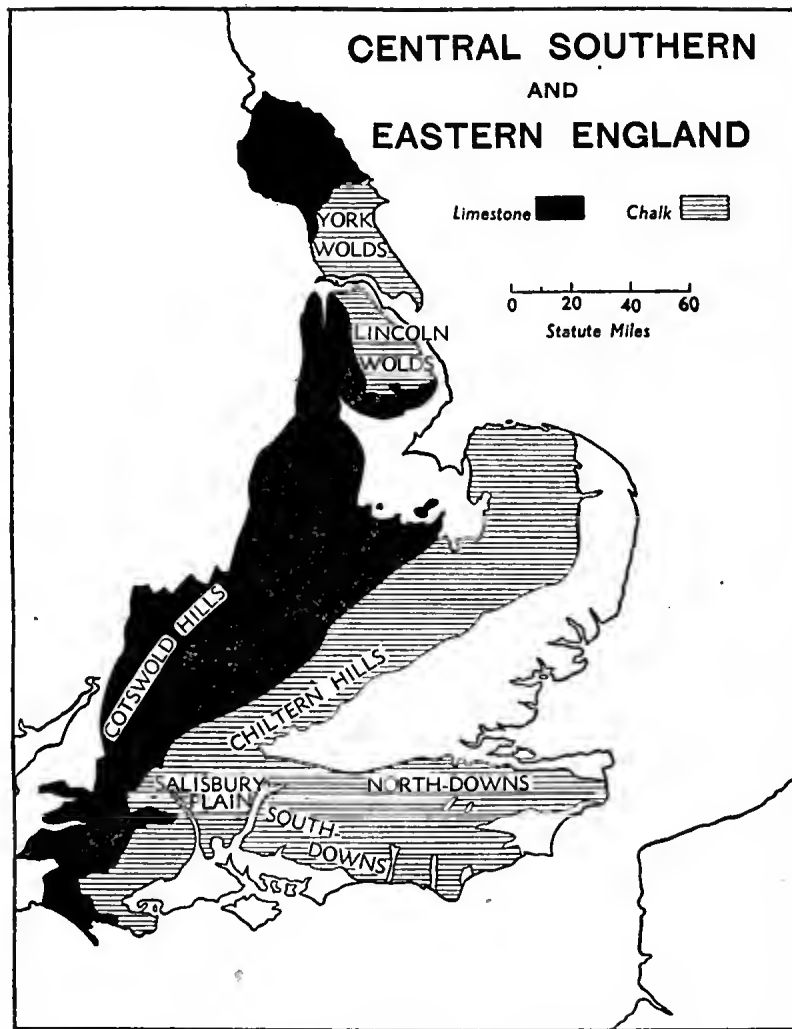


Fig. 27.

to the sea—the *North Downs*, ending at Dover, and the *South Downs*, ending at Beachy Head.

The chalk hills are on the whole lower and less bold in outline than the limestone hills. They are the great pasture grounds for sheep in southern England.

The remainder of south-eastern England consists mainly of fertile undulating plains of clay and gravel.

Fig. 27 is geological, not physical, *i.e.* it represents the underlying rocks rather than the surface features. The hills above mentioned occupy a much smaller area than that represented by the shading in the figure.

B. IRELAND

79. Physically, Ireland can be divided into three parallel divisions—

(1) A northern mountainous region, north of a line drawn from Dundalk Bay to Sligo Bay. It contains the *Mourne Mountains*, the *Antrim Plateau* (both of volcanic origin), the *Sperrin Mountains*, and the *Donegal Highlands*.

(2) The Central Plain, mostly between the Dundalk-Sligo line and the Dublin-Galway line. In the west this very level limestone plain is broken by the mountains of *Mayo* and *Connemara*.

(3) A southern mountainous belt, south of the Dublin-Galway line. Though this contains the two most extensive highland areas in Ireland, the mountains of *Kerry* and the *Wicklow Mountains*, it also contains considerable lowlands.

A remarkable feature of Ireland is the fact that most of the highlands are within a very short distance of the sea. The country has been compared to a saucer; but the edge of the saucer is broken in a good many places. There is a very wide gap in the east between the Wicklow Mountains and the Mourne Mountains.

RIVERS *

A. GREAT BRITAIN

80. The main watershed of the island, which has approximately the shape of an inverted T (Fig. 28), divides the rivers into three groups, viz. those which flow into (1) the eastern sea, (2) the western sea, (3) the southern sea. As the watershed is on the whole nearer the west than the east coast, the eastern rivers are generally longer than the western. The Severn and Clyde, however, are important exceptions. As the eastern rivers have a more gradual slope, they are also, on the whole, less rapid and more navigable.

* Details about particular rivers are given in Chapters VII.-IX.

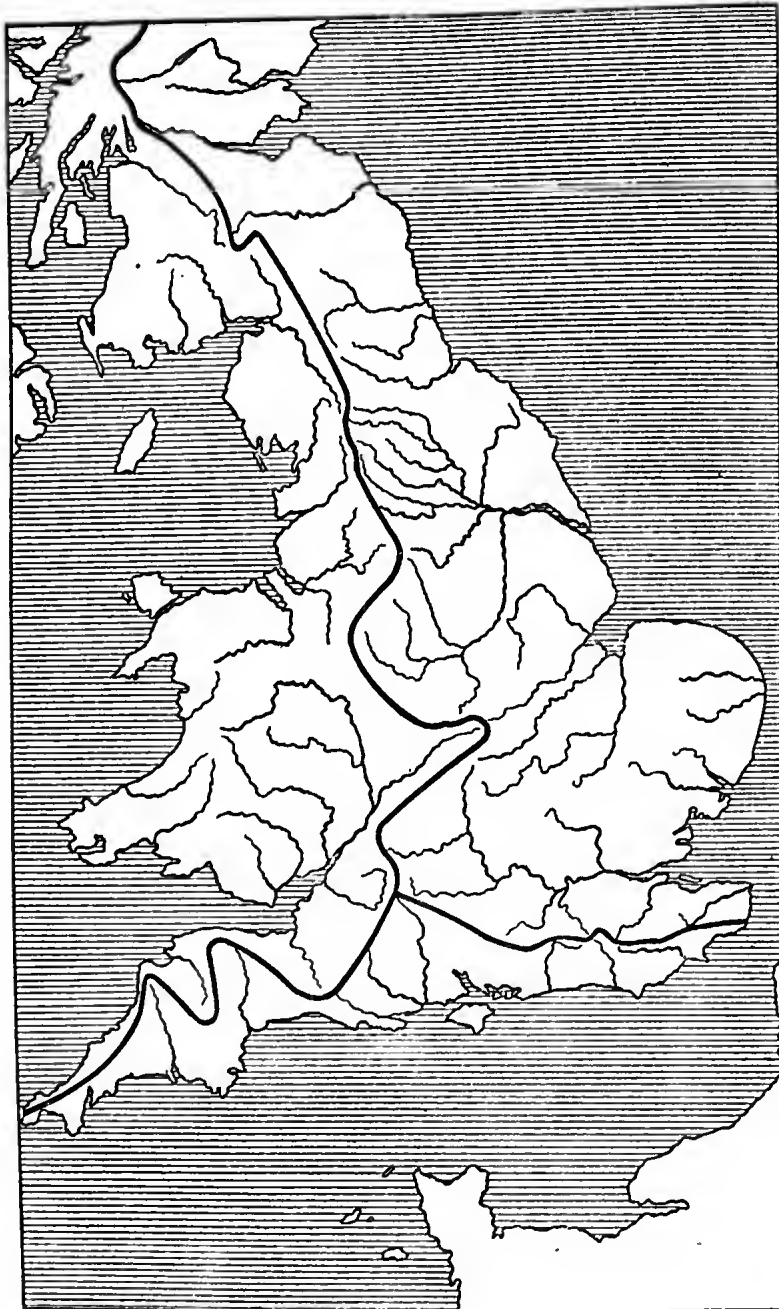


Fig. 28.

In the Scottish Highlands the western rivers are only short mountain torrents, but the chief eastern rivers are from fifty to one hundred miles long. The most important Highland rivers are the *Spey*, *Don*, *Dee*, *Tay*, and *Forth*.

The Southern Uplands send rivers in three directions—the *Teviot* and *Tweed* eastward, the *Clyde* northward, and the *Esk*, *Annan*, *Nith*, and *Dee* southward.

81. The north of England is the only part of the country that has a definite physical "backbone," and all the important rivers, except the Yorkshire *Derwent*, rise in the Pennine Chain. The rivers which enter the *Humber* drain an area of 9,400 square miles, or about one-sixth of the area of England and Wales. The four rivers which flow into the *Wash* drain an area of nearly 6,000 square miles, of which about half consists of the basin of the *Great Ouse* (145 miles long).

The two largest rivers of Great Britain are the *Thames* (215 miles) and the *Severn* (220 miles). The *Thames*, though slightly shorter than the *Severn*, drains a larger area (5,200 square miles) than any other river in Great Britain.

The Northampton Heights, though not a very striking physical feature, are an important watershed, giving rise to the *Welland*, *Nen*, *Warwick Avon*, and the *Cherwell*, the chief northern tributary of the *Thames*.

The chalk hills of the south-east are remarkable for the fact that many of the rivers flow *through* them in narrow water-worn gaps. See Art. 113.

B. IRELAND

82. In Ireland there is no clear connection, except in the south west, between the courses of the rivers and the land-relief. This is owing to the scattered grouping of the mountains and the position of the great Central Plain, on which very trifling differences of slope suffice to determine the courses of rivers. The rivers of the plain are naturally very slow, and expand into numerous lakes. There is only a fall of fifty feet on the *Shannon* between Lough Allen and Lough Derg.

The basins of the *Shannon* (250 miles), the longest river in the British Isles, and the *Barrow* (114 miles) together cover nearly one-third of Ireland. The chief northern river is the *Bann*, which flows from the Mourne mountains through Lough *Neagh*, the largest lake in the British Isles.

CLIMATE

83. The British Isles lie in the belt of westerly winds (Art. 41), and therefore the prevailing wind is south-west, especially in winter.

The climate is temperate and equable or insular, viz. free from great extremes of either heat or cold.

The average temperature of July decreases from 62° in the south of England to 56° in the north of Scotland. The hottest part of the country in July (64°) is a small area round London.

In winter the temperature does not diminish from south to north, but from west to east. In January the north of Scotland is as warm as the Isle of Wight, and Aberdeen is as warm as Cambridge. The south-west of Ireland and of Cornwall has in January an average temperature of 44°, but on the east coast the temperature is only about 38°.

The annual range of temperature, or the difference between the average winter and summer temperatures, increases from about 16° in the south-west to about 26° in London. Thus that part of England which is nearest to the Continent has also the most continental climate.

84. The rainfall of the British Isles diminishes from west to east, owing to the direction of the prevailing winds, and to the fact that the chief uplands lie near the west. The rainiest parts are the south-west of Ireland, Wales, the English Lake District, and the Western Highlands of Scotland. In Ireland there is considerably less difference in rainfall between east and west than there is in England, owing to the absence in Ireland of large tracts of high land. The average rainfall of Ireland is a little over forty inches a year, while that of Great Britain is only about thirty inches.

In Great Britain nearly all western districts have an average annual rainfall of 40 inches or more, but this is largely exceeded in some very mountainous districts; in the neighbourhood of Ben Nevis, Scafell, and Snowdon the average exceeds 100 inches a year, and in some years the rainfall exceeds 200 inches.

In the east of Great Britain the rainfall is generally under 30 inches. The driest part of the whole island is the district between the Humber and the lower Thames, with an average rainfall of less than 25 inches, occasionally falling below 20

inches. This comparative dryness is due to (1) absence of high land, (2) distance from the usual track of storms.

Thus there are very great variations of rainfall even in such a small area as the British Isles.

Generally speaking, the autumn and early winter are the rainiest parts of the year, but rainfall is well distributed throughout the year. There is nothing approaching a "dry season," such as many countries enjoy. October is generally the rainiest month.

85. The following table gives figures of the average climate in twelve British and Irish stations, which should be carefully located on a map. The figures in brackets denote height above sea-level.

The cooling effect of the sea in summer, and its warming effect in winter, are well illustrated by the differences between the figures for the Scilly Isles or Valentia and those for London (which, though a seaport, is, climatically, quite an inland town). On the whole the difference between summer and winter temperatures is slightly less in Ireland than in Scotland, and less in Scotland than in England.

TABLE OF CLIMATIC DATA FOR PARTS OF
BRITISH ISLES

	HOTTEST MONTH ° F.	COLDEST MONTH ° F.	RANGE OF TEMP. ° F.	ANNUAL RAINFALL
ENGLAND—				
London (100) ..	64·5	38	26·5	25
Oxford (200) ..	62	38	24	24·5
Liverpool ..	61·5	40	21·5	29
Scilly (100) ..	61	45·5	15·5	33
SCOTLAND—				
Edinburgh (300) ..	58	38	20	26
Fort William ..	57	39	18	80
Braemar (1100) ..	55	34	21	36
Wick ..	57	39	18	29
IRELAND—				
Dublin ..	60	41	19	28
Londonderry ..	59	40	19	41
Waterford ..	60	42	18	39
Valentia ..	59	45	14	56

VEGETATION AND ANIMALS

86. The following table shows the percentage area of different kinds of land in the four countries which compose the United Kingdom:—

	ENGLAND	WALES	SCOTLAND	IRELAND
Uncultivated (mountain, water, etc.)	12	12	22	23.5
Woods	5	4	4.5	1.5
Rough pasture (moor-land, heath, etc.) ..	7	25	48.5	52
Crops and grass ..	76	59	25	23

The "rough pasture" is only fit for grazing a few cattle and sheep, and will support only a much smaller number of animals than the same area of grassland. Note that this "rough pasture" covers about half the area of both Scotland and Ireland.

The table shows that in England more than three-quarters of the total area is cultivable ("crops and grass"), while in Scotland and Ireland the cultivable land is only about one-quarter of the whole. Furthermore, as England is more than $1\frac{1}{2}$ times as big as either Scotland or Ireland, the total area of cultivable land in England is roughly five times as great as in either of the other two countries.

The *forest* area, especially in England, was once much greater than it is now. The woods were mostly cut down centuries ago, for fuel or building, or to clear the ground for agriculture. Note the very small proportion of woodland in Ireland.

87. The most important grain crops are oats, barley, and wheat, of which oats occupy an area about equal to that of the other two. Till the early part of the nineteenth century England grew enough wheat to supply its own needs, but the growth of population and the competition of America and other countries, which can grow wheat more cheaply, have resulted in this country having to import a great deal more wheat than it grows. Wheat now forms the chief crop only in eastern England, especially Norfolk and Suffolk.

During the War there was a considerable increase in the area given to grain crops, while there has been a corresponding decrease in the numbers of "live stock," *i.e.* cattle, sheep, and pigs. Owing to the "mechanisation" of farming, the number

of horses used in agricultural work has decreased by about a half since 1920.

Roots (turnips, mangolds, etc.) are grown in all parts, but especially in Scotland. Potatoes are also grown everywhere, but are specially important in Ireland, in the north of which flax is an important crop. The area under sugar-beet has increased from about 5 square miles in 1920 to over 500 square miles (mainly in eastern England) in 1933. Sugar is obtained from two plants: (1) sugar-cane, a tall, thick grass which will only grow in tropical climates; (2) sugar-beet, which grows in cool, temperate countries, especially in Europe from France to Russia. Cane sugar is derived from the stem of the sugar-cane, beet sugar from the root of sugar-beet.

Fruit (apples, pears, plums, cherries, etc.) is grown chiefly in the Weald, the lowland parts of Devon, and the sheltered valleys of the lower Severn and of the Wye, in Gloucestershire, Worcestershire, and Herefordshire. Hops are important in the same districts, except Devonshire.

88. The most important domestic animals are cattle and sheep, and some of both can be found on almost every farm. Cattle are most numerous in the lowland parts of the west of the country, as they require richer grass and more water than sheep. Thus cattle are important in Wigtown, Cheshire, Carnarvon, Anglesea, Pembroke, Hereford, Devon, and on the well-watered plains of the Midlands. The districts where sheep are specially numerous are all hilly—the Southern Uplands of Scotland, the Pennine Range, Central Wales, the Lincolnshire Wolds, and the chalk downs of south-eastern England.

Ireland, which on the whole is rainier than Great Britain, has, in proportion to its area, far more cattle and far fewer sheep than the larger island. Ireland grows a large quantity of oats (about half as much as Great Britain), but very little wheat.

Figs. 29 and 30 show the distribution of sheep and cattle in England and Wales only.

MINERALS

89. By far the most important mineral in the British Isles is coal, which is found chiefly in the north and west of England, in South Wales, and in central Scotland. Till about the

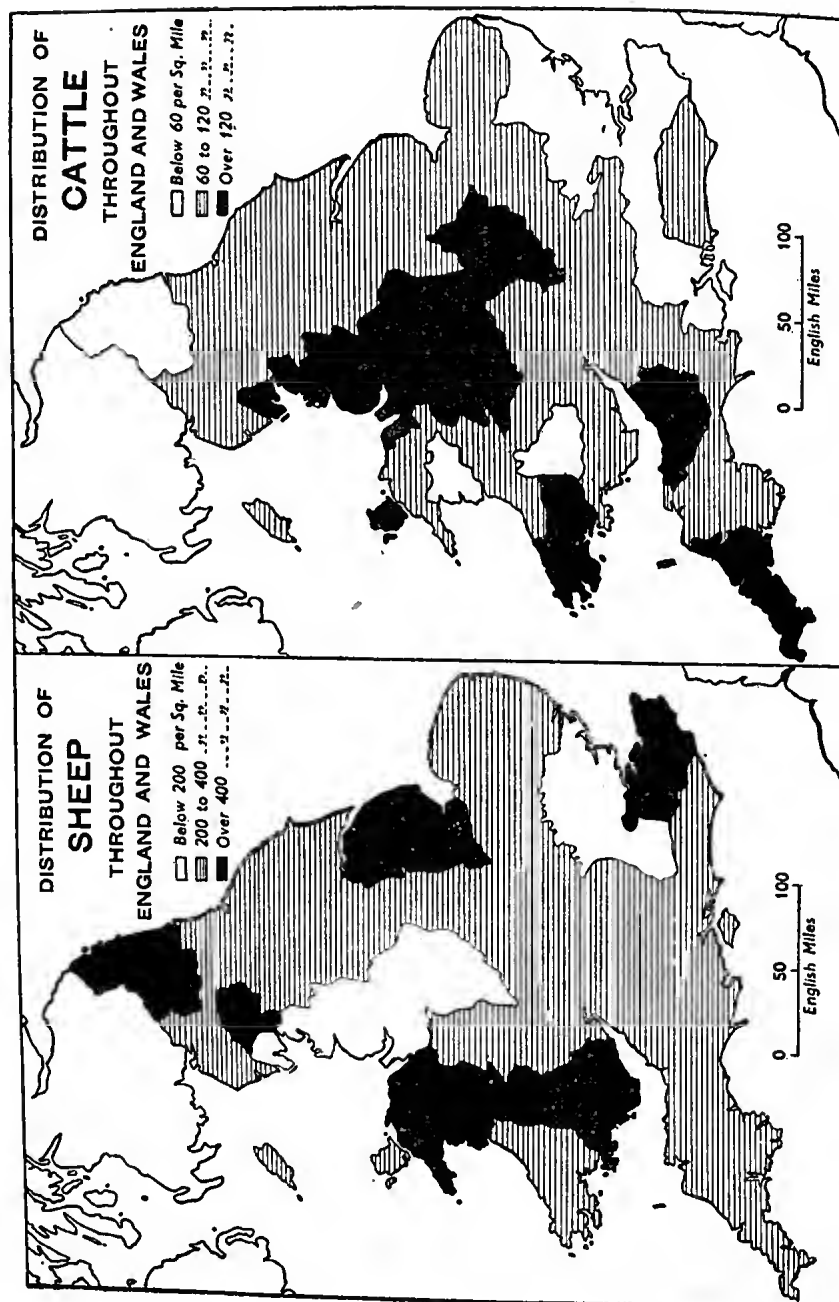


Fig. 30.

Fig. 29.

middle of the eighteenth century coal was chiefly used as a domestic fuel, and England was still mainly an agricultural country, with most of its population in the south and east. But the invention and improvement of the steam engine, and the consequent use of coal for developing steam-power, led to enormous changes, which transformed England from an agricultural into a manufacturing country, developed large industrial towns out of villages, and concentrated a large proportion of the population of the country on the coal-fields.

The most important coal-fields (Fig. 31), approximately in order of their production of coal, are the following. Particulars as to their chief towns and industries are given in Chapters VII. and VIII.

1. Yorkshire, Derbyshire, and Nottinghamshire.
2. South Wales.
3. Northumberland and Durham.
4. Scottish: (a) Lanarkshire, (b) Ayrshire, (c) Edinburgh, (d) Fife.
5. South Lancashire.
6. Midland: (a) North Staffordshire, (b) Warwickshire, (c) Leicester, (d) South Stafford and Worcester, (e) Shropshire.

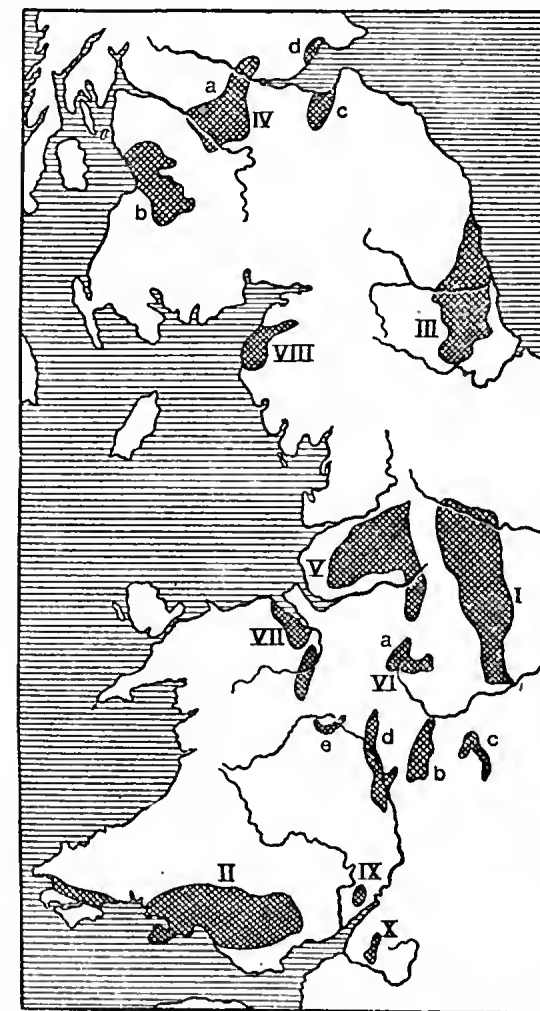


Fig. 31. COAL-FIELDS OF GREAT BRITAIN.

7. North Wales.
9. Forest of Dean.

8. Cumberland.
10. Bristol.

A small coalfield is being opened up in East Kent, near Dover, and its production is steadily increasing. The value of the coal raised in Great Britain is nearly nine-tenths of the total value of all minerals.

90. After coal, iron ore is the most important mineral. There are numerous kinds of iron ore, differing greatly in composition and value. By far the larger part of British ore is mined or quarried in different parts of the limestone or jurassic belt mentioned in Art. 78 (1), especially in the Cleveland Hills, a little south of Middlesbrough, in North Lincolnshire (Scunthorpe), and in Northamptonshire. A much smaller quantity of high-grade ore called hematite, containing over 50 per cent. of pure iron, is obtained from the Furness peninsula of North Lancashire and the adjoining part of Cumberland. Hematite ore is free from phosphorus, which spoils the qualities of steel. Phosphorus has to be extracted from jurassic ore in the process of smelting, and this ore was useless for steel manufacture until chemists discovered a way of getting rid of the phosphorus.

The deposits of iron ore found in England are not nearly sufficient for the requirements of the country, and large quantities are imported, especially from Spain and Sweden.

Of metallic minerals other than iron, tin and lead ores are the most important in this country. Tin has been mined for many centuries in Cornwall, the only part of Europe where any considerable quantities of this rather rare metal are found. Owing to the discovery of larger supplies of tin in Malaya, Bolivia, and other countries, where labour is very cheap, and where deep mining is often unnecessary, tin mining in Cornwall has greatly decreased. Until quite modern times Cornwall was the chief source of tin in the world. Lead ores are found in many hilly districts, and particularly in North Wales and the southern part of the Pennine Chain.

91. Non-metallic minerals, with the exception of salt, are generally obtained from quarries, not from mines. The most important are clay, sandstone, slate, limestone, granite, oil-shale, and salt.

Clay fit for coarse pottery is found in many districts. White china-clay (kaolin) for more delicate pottery comes chiefly from South Devon and Cornwall. Limestone and sandstone are widely distributed. The latter is used chiefly for building, the former for making lime and for road-mending. Granite, also used for building, is quarried chiefly in Devon and Cornwall and near Aberdeen. Slate is obtained from North Wales, near Snowdon, and on a much smaller scale from Westmorland and North Cornwall. Oil-shale, from which paraffin oil and wax are extracted by distillation, occurs on both sides of the Firth of Forth.

Rock-salt, which, apart from its food value, is of great importance in chemical manufactures, is mined chiefly in Cheshire, Worcestershire, and Durham. The salt is mainly obtained by flooding the mines with water, pumping up the brine, and evaporating it.

OCCUPATIONS, INDUSTRIES, AND COMMERCE*

92. Though Great Britain is principally a manufacturing and commercial country, agricultural work employs about 1,000,000 people in Great Britain. Ireland, though its population is only one-eighth of that of England, employs as many people in agriculture.

The largest industry classified under one heading in the *Statistical Abstract for the United Kingdom* is the "Manufacture of Metals, Machines, Implements, and Conveyances," employing over two million people. This industry has greatly increased since the beginning of the motor age about 1900.

The textile industries in the British Isles employ over a million people, of whom nearly half are cotton workers. Over a million people are employed in the work of transport, on railways, roads, canals, and docks; and about a million in coal mining. Building, with the manufacture of building materials (bricks, cement, etc.) is also a large industry.

FOREIGN TRADE

93. The total foreign trade (*i.e.* the sum of imports and exports) of the United Kingdom is much greater than that of any other country except the U.S.A. Broadly speaking,

* Arts. 92-6 may well be omitted on a first reading, and kept for revision lessons.

this country *imports* food and raw materials, and *exports* coal and manufactured articles.

The following tables give the principal imports into the United Kingdom, with the chief countries from which they come:—

IMPORTS INTO THE UNITED KINGDOM

I. FOOD

ARTICLES	PRINCIPAL SOURCES
Wheat and Flour	Canada, Australia, Argentina, Russia.
Barley and Oats	Argentina, Canada, Russia, Rumania.
Maize	Argentina, Rumania, Brit. South Africa.
Rice	Burma, U.S.A.
Meat	U.S.A., Argentina, Denmark, New Zealand, Australia.
Butter	Denmark, N.Z., Australia.
Cheese	Canada, N.Z., Holland.
Eggs	Denmark, Ireland, Egypt.
Fruit	Spain (oranges, grapes, etc.), U.S.A. (oranges, apples), Greece (currants), British West Indies (bananas, pineapples, etc.), Australia and South Africa (oranges, raisins, etc.).
Sugar	Czecho-Slovakia (beet-sugar), British West Indies, Cuba, Mauritius (cane-sugar).
Tea	India, Ceylon, China.
Cocoa	Gold Coast, British West Indies, Nigeria.

II. RAW MATERIALS

ARTICLES	PRINCIPAL SOURCES
Raw Cotton	U.S.A., Egypt, India, Peru.
Raw Wool	Australia, New Zealand, Cape Colony.
Flax	Belgium, Russia.
Hemp	Philippine Islands, New Zealand, Italy.
Jute	India.
Timber	U.S.A., Canada, Sweden, Finland, Norway, Russia, India (teak).
Palm Oil	British West Africa.
Oil Seeds	India, Egypt, Argentina.
Petroleum	U.S.A., Persia, Mexico, Borneo, Iraq.
Rubber	Straits Settlements, Ceylon, Brazil.
Iron Ore	Spain, Sweden.
Copper	Spain, U.S.A., Chile, Japan.
Tin	Straits Settlements, Bolivia, Nigeria.

The exports from the United Kingdom are considerably less in value than the imports. About three-quarters of the exports consist of manufactured articles, mainly of two classes: (1) textile fabrics—cotton, wool, linen, and jute; (2) machinery and metal manufactures—hardware, cutlery, ships, tin-plate, steel rails, etc. The only unmanufactured material largely exported is coal, which goes chiefly to France, Italy, and the Baltic countries.

A table at the end of this chapter gives the leading seaports of the United Kingdom in order of the values of their imports and exports. This list shows how London and Liverpool stand in a class by themselves as the two great commercial gateways of Britain, handling between them more than half the entire foreign trade of the United Kingdom.

It is interesting to note in this list the high position of Manchester, which was only made a port by the Manchester Ship Canal. Harwich and Bristol, with their remarkable disproportion between imports and exports, deal mainly with the import of foodstuffs, and are rather far from great industrial centres.

POLITICAL DIVISIONS AND POPULATION

94. The British Isles consist of (1) the United Kingdom of Great Britain and Northern Ireland, and (2) Eire. England and Wales are for nearly all purposes one country. Scotland is partly separate in government and laws, but has no separate Parliament. Northern Ireland has its own Parliament, but is also represented in the Imperial Parliament at Westminster. Eire is quite distinct, and is usually considered one of the British "Dominions" (Art. 384). The Isle of Man and the Channel Islands also have separate laws and governments.

Each country is divided into "counties," which for local affairs (education, police, maintenance of roads, etc.) are governed by County Councils. All the large towns, however, are "county boroughs" and have their own councils, independent of the county. Smaller towns, and even villages, also have councils, but their powers are more limited.

The inhabitants of the United Kingdom are a very mixed people. They mostly belong to the "Anglo-Saxon" race, which seems to have originated in northern Germany. There

are also Danish and Norwegian (Norman) elements in the population, but there was no great difference between these and the Anglo-Saxons. The people of Wales, Ireland, and the Scottish Highlands are mostly Celtic, and represent the inhabitants of these islands before the Anglo-Saxon invasions. A few of them are still so "foreign" that they cannot speak English, but have preserved their old Celtic languages.

DISTRIBUTION OF POPULATION

95. England and Wales form nearly half the area of the British Isles, but contain four-fifths of the population, and are thus much more densely populated than Ireland and Scotland, each of which measures about one-quarter of the total area; and contains about one-tenth of the population.

Eleven counties in England, one in Wales, one in Scotland, but none in Ireland, contained over a million people in 1931. These were the following:—

Population in thousands.			Population in thousands.		
London .. ..	..	4397	Lanark .. ..	..	1586
*Essex .. ..	..	1755	Durham .. ..	..	1486
*Middlesex ..	..	1638	Warwickshire ..	..	1535
*Kent .. ..	..	1219	Stafford .. ..	..	1431
*Surrey .. ..	..	1180	Glamorgan .. ..	..	1226
Lancashire ..	..	5039	Cheshire .. ..	..	1087
Yorkshire (West Riding)	..	3352			

These counties are thus centres of very dense population. It should be noticed that all of them, except London and the adjacent counties, contain important coal-fields, on which various manufactures have arisen. Reference has already been made (Art. 89) to the great importance of coal-fields, and if the map of coal-fields (Fig. 31) is compared with Fig. 32, which shows those parts of England and Wales having a population of over 500 to the square mile (large towns being excluded from the calculation), striking resemblances between the two maps will be noted. Fig. 32, however, does not mark the dense population of central Scotland.

96. There are in England and Wales about 40 towns having a population of over 100,000, and all of these, except Norwich, are on or very near to coal-fields, or else are seaports.

* Contains part of "Greater London" (Art. 114).



Will F. Taylor.

LITTLEPORT, CAMBS. RIVER OUSE.
A typical view of fen country.

The great majority of the large towns lie in the north or west of the country, as may be clearly seen by marking these towns on a blank map.* There is a great distinction between what may be called Metropolitan England (the south-east), which is mainly fertile agricultural land and has only one very large

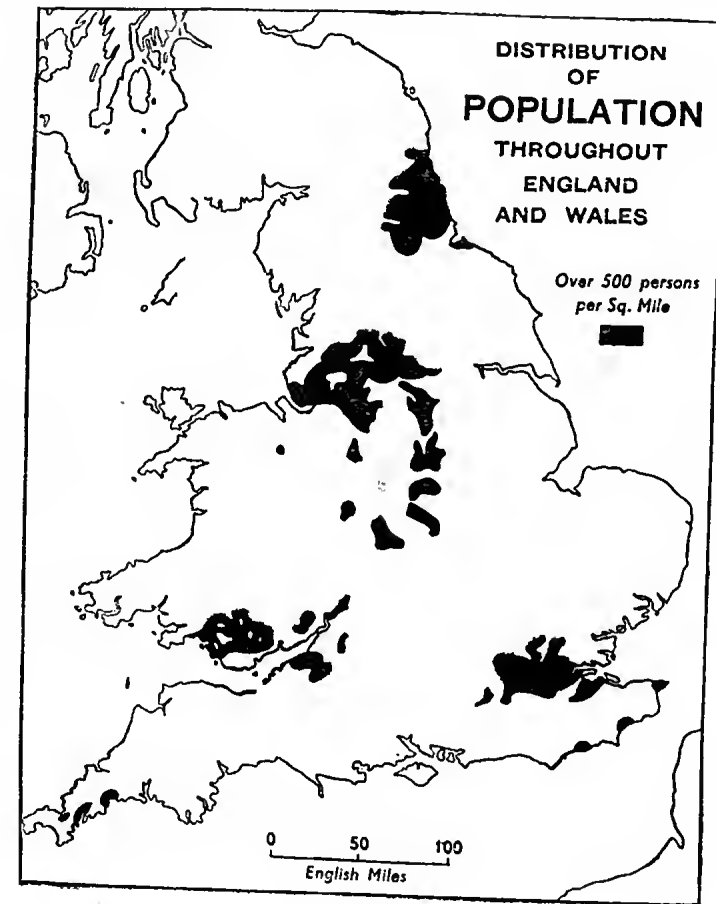


Fig. 32.

centre of population (London), and Industrial England, which contains nearly all the large manufacturing towns outside London, but also contains barren and almost uninhabited uplands. The limestone escarpment mentioned in Art. 78 is

* For list of large towns see statistics at end of this chapter.

roughly the boundary between Metropolitan and Industrial England.

Owing to the wide distribution of electrical power, there has been since 1920 a considerable movement of industry southwards, especially to the neighbourhood of London, where large new towns, *e.g.* Dagenham (Ford motor works) have arisen very rapidly. The "heavy" industries, *e.g.* actual manufacture of iron and steel, must remain near the coal-fields, but machine industries, such as the manufacture of motor cars, are now scattered over many parts of the country. Thus the former distinction between "Industrial" and "metropolitan" England is tending to become obliterated. Even Oxford is now a large industrial city.

Westmorland has the least population, in proportion to its area, of any English county (about 80 per square mile), but several counties in central Wales are less densely populated than Westmorland.

In Scotland the Midland Valley (Art. 148) from Forfarshire to Ayrshire is very densely populated, containing over two-thirds of the population of the country. Nearly one-third of the population is in the county of Lanark alone. The Highlands, on the other hand, are one of the most uninhabited parts of Europe; the county of Sutherland contains only an average of 10 people per square mile.

The population of Ireland is much more uniformly distributed over the country than that of either England or Scotland. Only four Irish counties (Dublin, Antrim, Down, and Cork) have populations of over 200,000, and only two (Carlow and Longford) have populations below 50,000. This is because Ireland is still mainly an agricultural country, and has few manufactures and no important coal-fields.

STATISTICS*

GREAT BRITAIN AND IRELAND

Area and Population

	AREA SQUARE MILES	POPULATION 1939 MILLIONS	POPULATION PER SQUARE MILE
England and Wales ..	58,300	41.46	711
Scotland	30,400	5.01	165
Northern Ireland ..	5240	1.29	246
Eire	26,600	2.95	111
Isle of Man	221	0.05	223
Channel Islands ..	75	0.09	1240
British Isles	121,100	50.85	420

PRINCIPAL TOWNS

England

	Population in thousands.		Population in thousands.
London (County) ..	4397	Hull	313
"Greater London" ..	8202	Bradford	298
Liverpool with Birken- head	1003	Newcastle	283
Birmingham	1002	Stoke-upon-Trent ..	277
Manchester with Salford	990	Nottingham	269
Sheffield	512	Portsmouth	249
Leeds	483	Leicester	239
Bristol	397	Cardiff	224
		Plymouth-Devonport..	210

* It should be borne in mind that the War of 1939-45 has brought about very great changes in production, trade and commerce, as in many other things. Neither pre-war nor war-time statistics are representative of the rapidly changing conditions of to-day, but they do, at any rate, give us a scale with which to compare later figures as they become available.

Other Towns with more than 100,000 Inhabitants

Blackburn	Derby	Preston	Stockport
Blackpool	Gateshead	Rhondda	Sunderland
Bolton	Huddersfield	St. Helens	Swansea
Bournemouth	Middlesbrough	Southampton	Walsall
Brighton	Norwich	Southend-on-Sea	Wolverhampton
Coventry	Oldham	South Shields	

and several boroughs adjacent to London (Croydon, West Ham, Willesden, etc.).

Scotland

	Population in thousands.
Glasgow	1088
Edinburgh	439
Dundee	176
Aberdeen	167
Paisley	86
Greenock	79

Northern Ireland and Eire

	Population in thousands.
Dublin	400
Belfast	390
Cork	76
Londonderry	40
Limerick	38
Waterford	27

PRODUCTION

(Approximate Averages, 1944-5)

	GREAT BRITAIN AND NORTHERN IRELAND	EIRE
Wheat (million tons)	2.7	.55
Barley " " " " " "	1.9	.15
Oats " " " " " "	3.1	.80
Potatoes (million tons)	9	3
Turnips and Swedes " " " "	12	3
Hay " " " " " "	6	4

ANIMALS (MILLIONS)

	GREAT BRITAIN 1945	EIRE 1944
Horses (for agriculture)	$\frac{1}{2}$	.5
Cattle	9 $\frac{1}{2}$	4
Sheep	18	3
Pigs	2	.4

AGRICULTURAL STATISTICS OF TYPICAL COUNTIES

(Approximate Averages)

I. GREAT BRITAIN

	PERCENTAGE OF TOTAL AREA				PER 100 ACRES	
	CROPS AND GRASS*	TOTAL CORN CROPS†	WHEAT	OATS	CATTLE	SHEEP
ENGLAND—						
Bedford	85	28	12	7	11	23
Cambridge	89	41	18	8	9	24
Cheshire	82	12	3	9	28	12
Cumberland	58	7	—	7	17	61
Devon	73	12	2	7	18	48
Hereford	84	12	4	4	19	57
Kent	75	14	5	5	9	89
Lincoln	90	33	9	7	14	55
Norfolk	81	31	9	6	10	31
Warwick	84	13	5	4	20	37
Yorkshire						
(N. Riding)	64	13	2	5	13	51
Yorkshire						
(E. Riding)	90	32	8	12	13	58
All England	75	17	5	6	15	42
WALES—						
Anglesey	85	12	—	11	31	51
Brecon	43	4	—	2	8	104
Carnarvon	48	5	—	3	14	72
Pembroke	79	12	—	7	23	35
All Wales	58	7	—	4	15	71
SCOTLAND—						
Aberdeen	50	17	—	15	14	17
Berwick	66	18	1	11	7	111
Fife	78	22	4	12	16	32
Ross and						
Cromarty	7	2	—	2	2	13
Wigtown	50	10	—	10	18	36
All Scotland	25	6	—	5	6	36

* Excluding mountains and heath land.

† Wheat, oats, barley, rye, beans, and peas.

II. EIRE

	PERCENTAGE OF TOTAL AREA			PER 100 ACRES		
	OATS	BARLEY	GREEN CROPS	CATTLE	SHEEP	PIGS
Kilkenny	5	3	5	30	17	5
Wexford	8	6	8	25	29	10
Cork	6	1	6	27	12	7
Limerick	2	—	3	39	5	7
Mayo	3	—	4	16	21	5

LEADING PORTS

Total Trade (Imports and Exports) 1938

	MILLION £
London	600
Liverpool (and Birkenhead)	350
Hull	100
Southampton	75
Bristol	70
Glasgow	60
Manchester	35
Tyne Ports	30

COAL AND IRON

	1938 MILLION TONS	1945 MILLION TONS
Coal raised in U.K.	226	174
Coal, coke, etc., exported	47	6
Iron ore raised in U.K.	12	14
„ „ imported	5	4
Pig-iron made	6.8	7

COMMERCE

I. FOODS—	IMPORTS		MILLION £	
			1938	1945
Grain and flour	50	37
Meat	86	67
Dairy produce	60	44
Beverages	40	32
Sugar	22	10
Fruit and vegetables	10	6
Tobacco	20	24

II. RAW MATERIALS—

Wood and timber .. ..	..	..	35	16
Cotton .. ..	..	..	33	22
Wool .. ..	..	..	27	21
Hides .. ..	..	..	14	9
Paper .. ..	..	..	12	10
Rubber .. ..	..	..	10	4

III. MANUFACTURED ARTICLES—

Oils, fats and resins .. ..	..	..	50	61
Machinery and electrical apparatus .. ..	..	..	35	16

	EXPORTS		MILLION £	
			1938	1945
Machinery	67	28
Chemicals	22	23
Cotton goods	50	16
Woollen goods	24	8
Iron and steel manufactures, and vehicles	50	29
Coal	32	3
Miscellaneous manufactures	25	12
Foreign and Colonial produce re-exported:		
wool, cotton, furs, tea, rubber, etc.	48	60

QUESTIONS ON CHAPTER VI

1. Explain the geographical reasons why cattle-farming is more important than sheep-farming in Ireland.
2. Name six of the most important coal-mining districts in Great Britain, and describe the industries carried on in connection with *one* of them.
3. What areas in Great Britain are (1) the most densely, (2) the least densely populated. Give reasons.
4. In what parts of the British Isles are (a) wheat, (b) fruit, (c) flax chiefly grown?
5. Give an account of the chief minerals of Great Britain, excluding coal.
6. Give a list of (a) six important imports, (b) six important exports, of the United Kingdom.
7. Find the average population per square mile in (a) England and Wales, (b) Scotland, (c) Ireland, (d) Lancashire (area 1850 sq. miles, population, 1931, 5,039,000. The other areas and populations can be found in statistics on preceding pages).
8. Mark on an outline map of England and Wales the positions of the large towns (over 100,000 inhabitants) given in the tables.
9. From the table of agricultural statistics give the counties in England, Wales, and Scotland which have in proportion to their area (a) the greatest number of sheep, (b) the greatest number of cattle, (c) the greatest area under wheat.
10. Describe and explain the agricultural contrasts between Cambridgeshire, Cheshire, and Kent.
11. The Lake District is one of the wettest, and eastern England the driest part of Great Britain. Explain carefully why this is so.

CHAPTER VII

ENGLAND AND WALES

TOWN SITES

97. Before entering on a description of English towns and districts it will be well to consider some of the chief causes which have produced the rise of large towns, not only in England but all over the civilised world.

The situation of most ancient towns was probably determined chiefly by *rivers*. Rivers provided a steady water supply in days when water-works were unknown. In the days of small sailing-ships many rivers were navigable which are not now important in this respect. And, even when a river was not navigable, its valley generally provided an easy route. Also a town on a river was more easily defended in mediaeval times than one entirely surrounded by land.

A large proportion of the ancient county towns of England are situated on the principal rivers of their counties. Look, for instance, at the positions of Newcastle, Carlisle, Durham, York, Chester, Nottingham, Lincoln, Bedford, Oxford, Reading, Maidstone, Shrewsbury, Worcester, Gloucester, Hereford, Exeter.

Bridge-towns arose at the lowest point at which rivers could be bridged, and, since high-level bridges were unknown till modern times, such towns were also at the highest point that could be reached from the sea, and therefore foreign goods had to be disembarked there. Such bridge-towns and sea-ports are London, Bristol (bridge-stow or bridge-place), Gloucester (the lowest bridge on the Severn till the nineteenth century), and Glasgow. The last-named owes its position as a seaport entirely to the artificial deepening of the Clyde, which was once fordable at Glasgow. Many river-mouths have to be dredged in order to make ports accessible to large modern ships. In ancient times ports were generally placed as far up rivers as possible, for security against pirates or foreign invaders. Some old ports have therefore had to establish "outports" lower down on deeper water. Thus most of the modern sea-borne trade of Bristol is carried out at Avonmouth,

about seven miles away, though small ships can come at high tide through the narrow Clifton gorge into the heart of the old city of Bristol.

Confluence-towns arise where two considerable streams meet, as two divergent routes unite there. Examples: Oxford, Reading, Lyons, Coblenz (Roman *confluens*), Khartoum, St. Louis.

Such names as Cambridge, Oxford, Hereford, Bridgwater, Bristol (see above), Innsbrück (the bridge of the Inn), and many others, indicate the early importance of places where rivers could easily be crossed.

A *central situation* in a particular region is favourable to the growth of a business town or a capital. Madrid, Berlin, and Moscow owe a good deal to their central positions. Paris, though not central with regard to France as a whole, is centrally situated on the central river of northern France, the most productive and important part of the country. Rome is not far from the centre of Italy and also of the whole Mediterranean region. If the whole world is taken into account, London is an example, for it is the most central large town in the land hemisphere of the world.

Towns lying on the borders of mountain ranges, near points where the range is easily crossed, tend to become important commercial or military centres. Examples: Milan (at the junction of routes from several Alpine passes, Art. 184), Turin, Innsbrück, Verona, Peshawar.

Towns on *straits* may be important as ferry-towns (Dover, Istanbul) or as calling places for ships passing through the straits (Gibraltar, Aden).

The examples so far given are mostly those of towns that have been important for a long period, on account of permanent geographical advantages. In modern times the growth of large industrial and commercial towns—at least in the British Isles and Europe—has been mainly due to *coal-fields*. With very few exceptions all the large towns of the United Kingdom are either seaports or are on coal-fields, and the great majority of them have only become large within the last century, through the use of steam-power (dependent, of course, on coal) for manufacturing purposes. The presence of *iron* ores not too far from coal-fields, and (in a few parts of the world) rich *gold-fields* have also been the cause of the growth of large towns. Middlesbrough and Johannesburg are

leading examples of entirely modern towns whose rise is due to iron and gold respectively.

Some towns owe part—in some cases a large part—of their importance and size to their being *capitals*. In a modern capital many thousands of people are directly employed by the government, and besides this, the capital is generally the chief centre in the country of fashion, art, literature, and science, with the trades and manufactures which depend on them.

A number of towns, some of them (such as Brighton, Blackpool, Scarborough) being of considerable size, exist chiefly to provide lodging, amusement, and recreation for visitors. They can be briefly described as “*pleasure-towns*.” Others, such as Bournemouth, Torquay, Harrogate, are not so much pleasure towns (though they are partly that) as health-towns. Many of these are of recent growth.

Some places are important almost solely for naval or military reasons:—Portsmouth, Devonport, Cherbourg, Metz, and many others.

The causes which lead to the growth of large towns are often very complex, and sometimes difficult to state precisely. It will be generally found that some one or more—it may be several—of the above-mentioned causes have been at work.

GENERAL

98. For purposes of detailed description it is not easy to divide a complex country like England into “*natural regions*.” The division adopted in this chapter is based largely on the river system, with some modifications due to various reasons.

We shall start with a description of the Pennine Chain, as the most important physical feature of the north of England, and the chief natural obstacle between important places. Then follow sections on the regions east and west of the Pennines: on the west (1) the Lake District and its outskirts, (2) Lancashire; and on the east, (1) Northumberland and Durham, occupied by a number of similar and *parallel* rivers, (2) Yorkshire, which is *nearly* the same as the basin of the Ouse. The Trent basin is the next natural division, with a sub-section on Birmingham and the Black Country, which, though partly in the Severn basin, ought to be treated as a whole.

Eastern England between the Humber and the Thames is included in the two sections on the basin of the Wash and East Anglia, which are not separated by any distinct features. Then comes the Thames basin, with a sub-section on London and its outports. The south of the country is divided into three sections: (1) the South-East, including the Weald and the Downs, (2) the Hampshire Basin and its surrounding uplands, (3) the South-West, mainly occupied by the Devon-Cornwall peninsula. Next to this comes the small but important basin of the Bristol Avon, and then the Severn Basin. Wales is so distinctly a separate geographical unit that it requires separate treatment. Finally, the Cheshire Plain completes the circuit of the country, connecting North Wales with our starting-point, the Pennine Chain.

THE PENNINE CHAIN

99. The Pennine Chain, which extends from the Scottish border to the middle of Derbyshire, is not so much a range of mountains as a plateau of high bleak moors, with many deep narrow river valleys. In the north it is continuous with the Cheviot Hills and the Southern Uplands of Scotland. On the west it is joined to the Cumbrian Mountains by the wide ridge called *Shap Fell*, 1,000 feet high. Elsewhere the plateau falls on all sides to low plains.

Look at the sketch-map (Fig. 33), and name all the rivers shown in it. Notice that, especially in the northern part, the watershed between eastern and western rivers lies near the west of the plateau, and consequently the eastern rivers have considerably longer courses than the western. The highest point, *Cross Fell* (2,900 feet), is close to the western edge of the plateau, overlooking the Eden valley. Three other mountains, Whernside, Ingleborough, and Penygent (each about 2,400 feet) lie near together round the source of the Ribble.

The Pennine Chain is built up chiefly of limestone and a very hard sandstone called millstone grit. The hills are rounded or flat-topped, and generally covered with coarse grass or heather, trees growing only in the valleys. The heather-clad moors are very beautiful in the autumn. There are numerous caves, underground streams, and "pot-holes," i.e. deep holes into which streams disappear. These features

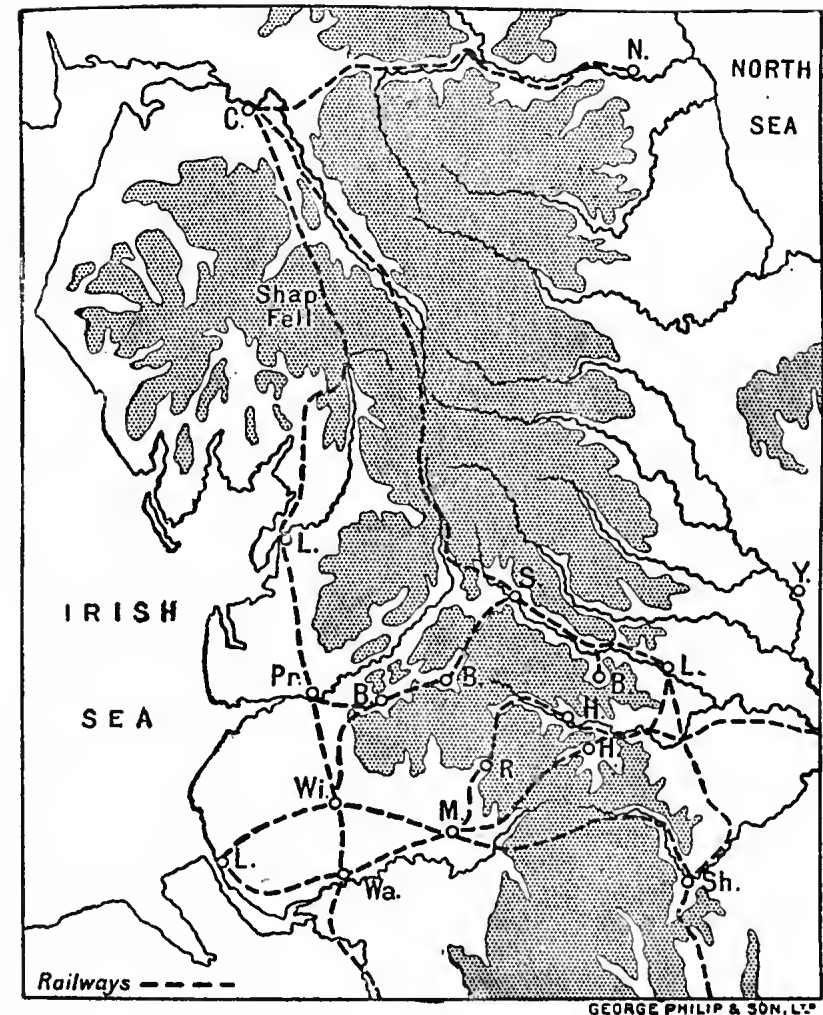


Fig. 33. PENNINE RAILWAYS.

Land over 500 feet shaded.

are due to the solvent action of rain water on limestone, and are found in almost all limestone plateaux. The river Aire flows underground from Malham Tarn to Malham Cove. The southernmost part of the range, the Peak district, has bold limestone cliffs and narrow water-worn gorges.

Note in Fig. 33 that there are two important "gaps" or low passes where the Pennines can be crossed at less than

500 feet above sea-level. The northern pass is called the *Tyne Gap*. It affords an easy route between Newcastle and Carlisle. The Romans built a wall (Hadrian's Wall) along the Tyne Gap to keep out the Scots. *Wallsend*, near Newcastle, marks the site of the eastern end of the wall. The southern pass is called the *Aire Gap*, though the western part of it is formed by the Ribble. Leeds and Blackburn lie at the extremities of the Aire-Ribble Gap on the edge of the plains.

North of the Aire Gap the Pennine Chain is a land of small market towns, tiny villages, and farms. There are many sheep, and the heather moors are famous for grouse.

From the Aire Gap southwards to the valley of the Don the conditions are wholly different. Here there are numerous large towns in the valleys (name those marked in the bottom half of Fig. 33), and the chain is crossed by no less than five railway lines, all with long tunnels. Three of these five routes also have canals—the Leeds and Liverpool Canal through Skipton and Blackburn, and two canals from the Calder to Manchester. The reason for this extraordinary development of means of communication through a very difficult district is the existence of a great coal-field on each side of this part of the Pennines (Arts. 103, 107). There are extensive stretches of almost uninhabited moorland separating the towns east and west of the Pennines.

NORTHUMBERLAND AND DURHAM

100. These two counties consist of a narrow coast plain in the east, and part of the Pennine plateau in the west. The north and west are agricultural and pastoral. There are many old castles, and the battlefields of Otterburn, Hexham (commanding the east of the Tyne gap), Flodden and Halidon Hill also show the former military importance of this district.

A great coal-field extends southwards from near the mouth of the Coquet almost to the Tees, and is traversed by the rivers Tyne and Wear. The chief town of the district is *Newcastle*, at the lowest point where the Tyne could be easily bridged. Gateshead is on the south side of the river, opposite Newcastle. Tynemouth and South Shields lie on the north and south banks at the mouth of the river. These "Tyne ports" almost form one continuous town. The chief occupation originally was exporting coal (formerly called

"sea-coal" to distinguish it from charcoal) to London and other places in England, but in addition there are now great ship-building, engineering (especially marine engines), chemical, and glass works.

The Wear, which flows through the whole length of the county of Durham, has the port of Sunderland at its mouth. This is also a great ship-building place. The old cathedral city of Durham stands on a cliff almost surrounded by a loop in the river, and was therefore an ideal place for a fortress.

The lower Tees has a wide, very flat valley, communicating southwards with the Vale of York. The ports at the mouth are Stockton, Middlesbrough, and the Hartlepoons. Locate these on the map. A few miles south of Middlesbrough lie the Cleveland Hills. These limestone hills contain great deposits of iron ore. The iron is smelted round the mouth of the Tees, particularly at Middlesbrough, an entirely modern town, where there is also some ship-building.

Middlesbrough is one of the most favourably situated towns in the world for iron manufacture, having coal, iron ore, and limestone, the three essential materials, in the immediate neighbourhood, and being also on the bank of a navigable river.

Middlesbrough and the Cleveland Hills are, of course, in Yorkshire, but industrially they are really part of the Durham district.

THE LAKE DISTRICT

101. The Lake District is a sort of dome of highland trenched by deep narrow valleys which radiate in all directions from the neighbourhood of Helvellyn (3,100 feet). Many of the valleys contain beautiful narrow, deep lakes. The chief rivers flow southward from Windermere, northward from Ullswater, and westward from Derwentwater.

Almost all lakes are being slowly filled up by mud and sand washed into them by rivers. At the upper end of each English lake you will find a small delta round the mouth of a stream. Where streams flow in at the sides of a narrow lake they form deltas which eventually stretch right across the lake. This has happened between Derwentwater and Bassenthwaite, which were once one lake.

The highest mountain in England, Scafell (3,230 feet), lies south of Derwentwater. Skiddaw (3,050 feet) is north of

the same lake. Thirlmere, which naturally drains into Derwentwater, has been made into a reservoir to supply Manchester with water, and Manchester has recently annexed another lake, Hawes Water, for the same purpose.

Only one railway crosses the Lake District. Follow its course on the map, and name the towns at each end and in the middle of it.

The Lake District proper has only one town, Keswick. There is a small manufacture of lead pencils here, though the plumbago (black lead) mines of Borrowdale, a few miles to the south, have long been exhausted, and the mineral is now imported from Ceylon. This is an example of "industrial inertia," that is, the survival of an industry after the conditions which produced it have disappeared.

Slate is quarried in the Lake District, particularly in Westmorland.

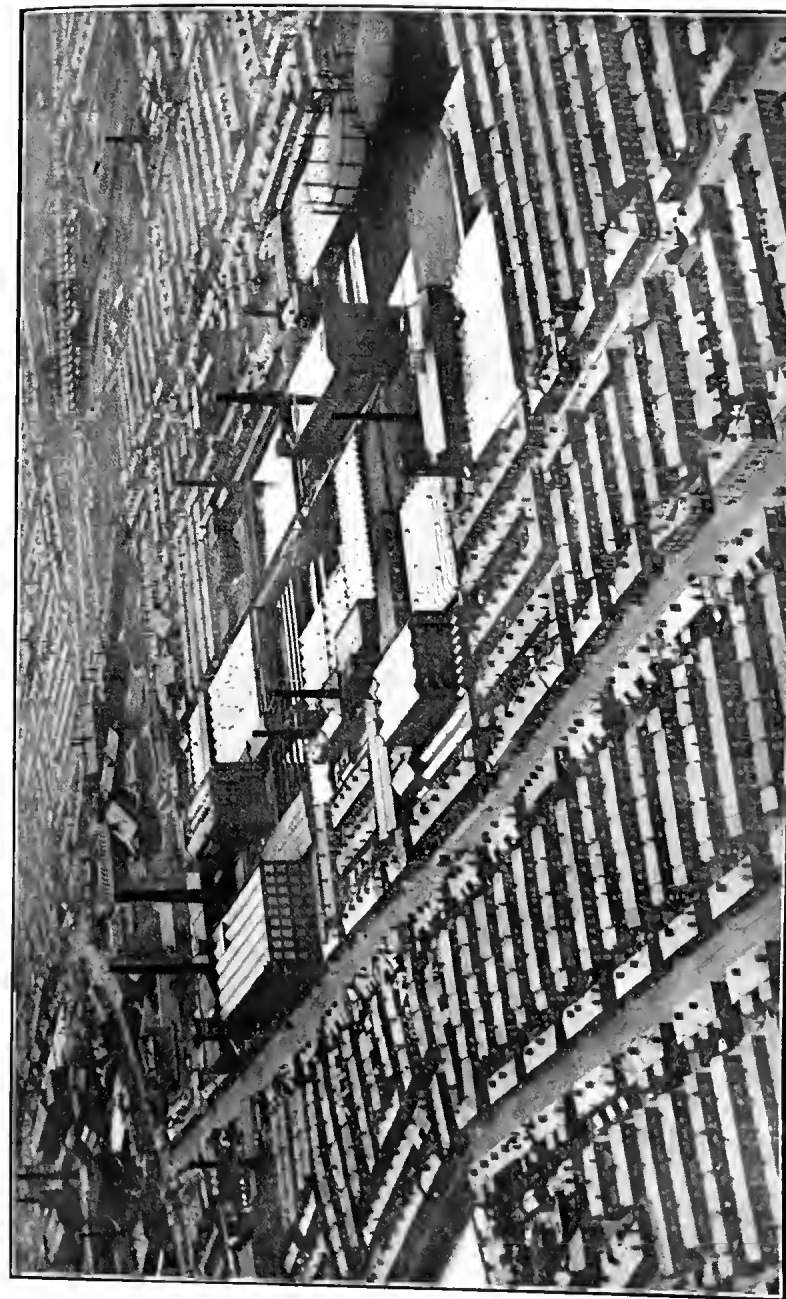
OUTSKIRTS OF THE LAKE DISTRICT

102. (1) On the north is a low, flat plain of fertile pasture-land surrounding Solway Firth. The only large town in the English part of the plain is Carlisle, a place of great historical importance from its command of the western routes into England from the north. It is now a great railway junction, the meeting place of five important main lines—three in Scotland and two in England—besides some branch lines from the Lake District and the Tyne Gap.

(2) On the narrow coast plain west of the lakes is a small coal-field, with some iron manufactures. Some of the coal mines here extend far under the sea. Maryport, Workington, and Whitehaven are the three ports of this coal-field.

(3) South of the lakes, in the Furness peninsula of Lancashire, there are deposits of rich iron ore. This has produced great ship-building and engineering industries at Barrow-in-Furness, an entirely modern town, like Middlesbrough. Walney Island acts as a natural breakwater to the harbour of Barrow.

Furness is separated from the rest of Lancashire by the wide, shallow Morecambe Bay, which receives the river Leven from Windermere and the Lune from Shap Fell. The pleasure-town of Morecambe is on the east side of the bay.



AN AERIAL VIEW OF PRESTON.

This picture shows a cotton mill and the overcrowding of houses in an industrial area.

LANCASHIRE

103. Lancashire, excluding Furness (Art. 102), is on the whole a very flat county, containing only a small proportion of the Pennine uplands. The coast plain, like the county, is narrow in the north and wide in the south. The coast is very low, and bordered in many places by sand-dunes. Name the chief rivers which enter the sea in Lancashire.

Name the chief rivers which enter the sea in Lancashire, and the ports at or near their mouths. All these rivers have wide estuaries, but all are comparatively shallow, except the *Mersey*, which has been artificially deepened. The great South Lancashire coast

The great South Lancashire coal-field (Fig. 31) occupies most of the country between the Mersey and the Ribble.

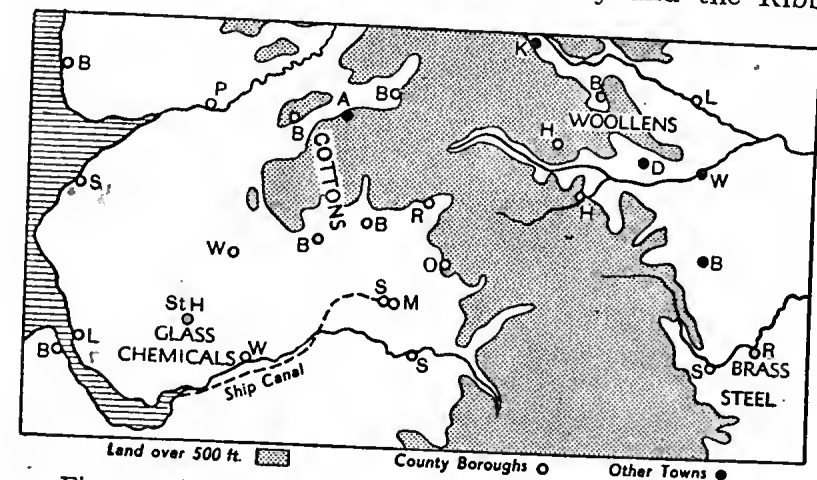


Fig. 34. SOUTH LANCASHIRE AND WESTERN YORKSHIRE.

Nearly all the coal raised here is used in the district itself, and very little is exported.

South Lancashire is the greatest centre in the world of cotton manufacture. The group of towns just north of Manchester—Bolton, Bury, Rochdale, Oldham—are chiefly engaged in spinning the raw cotton into threads. Wigan is an important centre of the coal trade. A little further north another group of towns—Preston, Blackburn, Accrington, Burnley—convert the spun thread into woven fabrics (Fig. 34). Manchester (with Salford adjoining it) is the chief centre of the textile industry.

Manchester (with Salford adjoining it) is the largest town of the whole district, but is not so much a great manufacturing as a commercial centre—a place for buying, selling, and

warehousing goods, distributing raw cotton to the other towns and receiving manufactured cotton from them. Manchester has been made into a seaport by the construction of a ship canal, thirty-five miles long, from the Mersey estuary. This enables large ships to bring cargoes of cotton and other goods direct to Manchester, and thus saves the cost of the railway journey from Liverpool and that of unloading and reloading.

Many of the cotton towns, *e.g.* Manchester, Bolton, and Oldham, manufacture machinery for spinning and weaving. There are great chemical works at Widnes and St. Helens, using the salt which is plentiful in Cheshire (Art. 132). Warrington has large tanneries, using hides obtained from the cattle of the Cheshire Plain, or from abroad.

The centralisation of the English cotton industry in South Lancashire is due partly to the abundance of local coal; partly to the fact that Lancashire faces the chief source of raw cotton—the United States; and partly to the damp atmosphere, which is essential to the spinning of cotton. In drier climates the mills have to be “steamed.”

LANCASHIRE PORTS

104. Compare on the map the estuaries of the Dee, Mersey, and Ribble. The Mersey estuary is “bottle-necked,” and there are therefore rapid tidal currents through the narrow entrance, which help to keep it deep and free from sandbanks (Art. 73). This fact largely accounts for the growth of the great seaport of Liverpool, which has, however, become important only in the last two hundred years, at the expense of Chester and Preston. The docks extend for about six miles along the Mersey, and the trade of Liverpool is second only to that of London. Its chief imports are raw cotton, wheat and flour, meat, wool, timber, rubber, and tobacco. Most of these things, except wool, come from America. Liverpool exports cotton goods from Lancashire, woollen goods from Yorkshire, and machinery, metal goods, and chemicals. It is also a great passenger port, though many of the largest liners now use Southampton as a starting point, instead of Liverpool.

Birkenhead, on the Cheshire side of the Mersey, is practically part of Liverpool, with which it is joined by

ferries and railway and road tunnels. It is a ship-building place.

Southport, Blackpool, and Morecambe are the chief pleasure-towns of the Lancashire coast. Fleetwood, Heysham, and Barrow carry passengers and goods to and from Ireland and the Isle of Man.

YORKSHIRE

105. This, the largest English county, is divided for purposes of local government into three Ridings or “thirds”—west, north, and east, which for administrative purposes are separate counties. Yorkshire contains three separate uplands:—(1) the most important part of the Pennine plateau (Art. 99); (2) the North York Moors, including the Cleveland Hills (Art. 100); (3) the Yorkshire Wolds, which are of much less height and extent, and are composed of chalk instead of limestone. The chalk ridge ends in the bold cliffs of Flamborough Head.

On the east of the Pennines is the wide plain, broadening towards the south, called the Vale of York, through which flows the Yorkshire Ouse, the largest river of northern England. It is called Ouse only below the junction of the Swale and Ure. The Nidd, Wharfe, Aire, and Don flow into the Ouse from the Pennines. The only important left bank tributary is the Derwent. This river rises within about five miles of the sea, between Scarborough and Whitby, and at one time probably flowed direct to the sea at Filey.

During the Ice Age the Derwent was dammed by glaciers or moraines, and formed a large lake in what is now the Vale of Pickering, the lake finding an outlet south-westward to the plain of York. Ultimately the river cut down its bed sufficiently to empty the lake, the dry bed of which is now a rich agricultural district. The history of this river illustrates the truth of the statement that “lakes are only temporary features of the landscape” (though the changes mentioned above occupied thousands of years). See also Art. 101.

106. North of Flamborough Head the Yorkshire coast is high and rocky, with numerous picturesque little bays, on the steep shores of which are small fishing villages. The limestone cliffs are the end of the North York Moors.

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Scarborough is a large pleasure-town. In the south the Wolds sink to the flat peninsula of Holderness, largely covered with alluvial soil. It has a low, remarkably even coast, which is being slowly washed away southwards, forming new sandbanks in the Humber and the Wash.

The great port of north Yorkshire is Middlesbrough (Art. 100). In the south is the much larger and more important port of Hull (its proper name is Kingston-upon-Hull) on the wide estuary of the Humber, which is the outlet of both the Ouse and the Trent. Hull is the great port for the trade of England with the Baltic countries. It imports wool (both from Europe and Australia), timber, grain, iron ore (from Sweden for Sheffield), oils and oil-seeds (for paint and soap industries and cattle foods), and dairy products and other foodstuffs. It exports woollen goods, machinery, and coal.

Hull is also a great fishing port, though in this respect it is inferior to Grimsby (in Lincolnshire), which is both nearer the sea and nearer London. This latter advantage is greater than appears at first sight from the map, as no railway crosses the Humber or the Ouse till the small port of Goole is reached.

York, the Roman Eborācum, owes its importance to its central position in the plain. It is the ecclesiastical capital and the chief military station of the north of England, a great agricultural centre, and an important railway junction.

Doncaster, the only other considerable town of the Plain of York, is also important as a railway junction, and contains the engineering works of the London and North Eastern Railway. Important new coal mines are being rapidly developed in the district round Doncaster. It has been found by numerous borings that the great Yorkshire coal-field extends much farther east (though at a great depth) than was formerly supposed, or than is shown in Fig. 31. Scunthorpe is a rising iron-smelting town in North Lincolnshire, just off the coal-field.

THE WEST RIDING

107. The south-west of the West Riding is, with the exception of Lancashire, the greatest industrial district in England (Fig. 34). This is due to the great coal-field, about 20 miles wide and 60 miles long, lying on the eastern flanks of the Pennine Range from Leeds to Nottingham (Fig. 31). The northern part of the coal-field is the chief centre of wool

manufacture. This industry arose at first owing to the sheep on the Pennine moors and the water-power of the rapid streams in the "dales," but has grown enormously with the use of coal to supply power. The absence of coal accounts for the decay of similar industries in central Wales, at Welshpool and other places.

Leeds is the chief town of the woollen district. It is the chief centre of the ready-made clothing trade, and also manufactures iron, steel, and leather. Barges carrying over 100 tons of cargo can reach the town from Hull. The importance of the place is partly due to its position at the entrance to the Aire Gap.

To the west and south of Leeds, in the valleys of the Aire and Calder, lies a cluster of towns all engaged chiefly in various branches of woollen manufacture (Fig. 34). Much the largest of these towns is Bradford, which makes dress goods, alpaca, and mohair. Other considerable towns are Halifax (carpets), Huddersfield (broadcloths), Dewsbury and Batley (shoddy), and Keighley (machinery). Barnsley had once a considerable linen manufacture, but is now chiefly a mining town.

In the valley of the Don, farther south, Sheffield is the chief centre in the world for the manufacture of cutlery and tool-steel, owing partly to the excellent quality of the grindstones quarried in the neighbourhood. Armour plates and steel rails are also produced. The iron ore, formerly obtained locally, is now chiefly imported from Sweden and Spain. Rotherham, a few miles lower down the river, manufactures brass as well as steel.

THE TRENT BASIN

108. The Trent rises in the moors of North Staffordshire. Near its source is a group of towns called the Potteries. The largest of them are Burslem, Hanley, and Stoke, which, with some smaller towns adjoining them, have been united in one town called Stoke-upon-Trent. The great industry of this district is the manufacture of earthenware and china. Coal is got from the North Staffordshire coal-field. The clay used is partly local, but large quantities are brought by sea from the south coast to the Mersey, and thence by canal to the Potteries.

Near the point where the Trent leaves Staffordshire is the town of Burton, which is famous for brewing. A few miles below it the Trent is joined by its first important tributary, the Dove, which separates the counties of Derby and Stafford. Near its source is the health-resort of Buxton, the highest town in England (about 1,000 feet).

The next tributary, the *Derwent*, rises near the Peak, and flows through the whole length of Derbyshire. The chief town on it, Derby, is the headquarters of the Midland Railway, and is one of the few places in England where silk is still manufactured (the others are Macclesfield in Cheshire, Coventry, and London). Derby also makes china, "Crown Derby" ware. Chesterfield and Mansfield are important colliery centres between the Derwent and the Trent.

The Trent has only one important right-bank tributary, the Soar. On this river is the large town of Leicester, which has manufactures of leather and woollen hosiery.

The largest town on the Trent itself is Nottingham, the staple industry of which is machine-made lace and cotton hosiery.

The Trent is navigable as far as Nottingham.

BIRMINGHAM AND THE BLACK COUNTRY

109. In the extreme south of the Trent basin, almost on the watershed between the Trent and the Severn, is Birmingham, the largest town of the Midlands (Fig. 35). It lies just off the edge of the South Staffordshire coal-field, but the town itself is in Warwickshire. Birmingham is the chief centre in England of metal manufactures, chiefly iron and brass goods. It makes firearms, bedsteads, bicycles, motor cars, watches, jewellery, and many other things. Owing to its central position, at almost equal distances from the four great ports of London, Bristol, Liverpool, and Hull, Birmingham is a great railway centre, and it is connected by canal with the Severn, Trent, and Thames.

A little west of Birmingham, mostly in South Staffordshire, is a group of towns almost adjoining each other—West Bromwich, Walsall, Wolverhampton, Dudley, and others. This district, which lies on the high ground (about 500 feet) between the Severn and the Trent basins, is called the **Black Country**, because it is full of furnaces and factories. Its industries are much the same as those of Birmingham, with

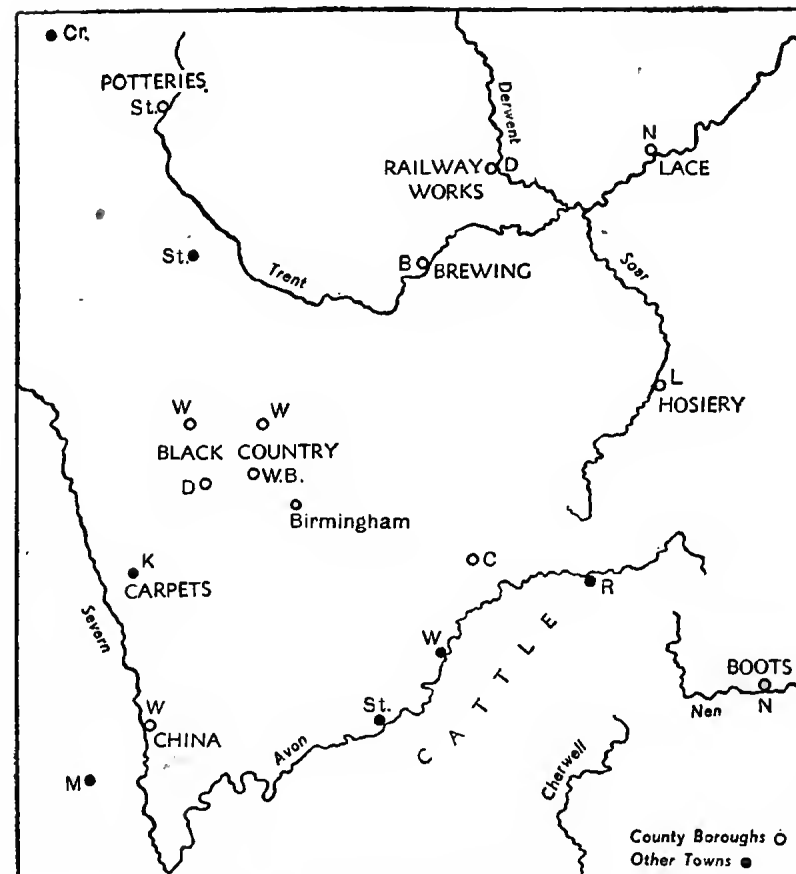


Fig. 35. CENTRAL ENGLAND.

the addition of iron-smelting, from the ore found on or near the coal-field. There is a complicated network of canals, railways, and tramways.

THE BASIN OF THE WASH

110. The rivers flowing into the shallow sandy inlet called the Wash are the Witham, Welland, Nen, and Great Ouse. The watershed between these rivers and the Trent and Severn is formed by a line of limestone hills called the Northampton Heights, which rise to a little over 500 feet. These hills give rise to the Warwickshire Avon, the chief

English tributary of the Severn. Its source is close to those of the Welland and the Nen.

Around the Wash, and especially to the south and west of it, is a considerable area called the *Fens*, which is the flattest part of England, and is practically at sea-level. It is covered with alluvial soil, *i.e.* soil brought down by rivers and spread over the land during floods. Till the seventeenth century the Fens were almost impassable marshes, with a few small towns, such as Ely, built on gravel mounds rising a little above the general level. The country has been drained and embanked, and is now very fertile land, with innumerable canals and wide ditches made for the purpose of drainage.

One of the long straight canals, called the Bedford Level, was used to demonstrate experimentally the curvature of the earth's surface. It was shown by actual telescopic observations that the surface of the water was not flat, but curved.

On the west, as already mentioned, the Fens are bounded by a limestone ridge. On the north, east, and south they are enclosed by chalk hills—the Lincoln Wolds and the East Anglian Heights.

The Witham rises on the west of the limestone ridge, and then flows through it in a narrow gap where Lincoln stands, with its cathedral, high above the river. The small town of Boston is near the mouth of the Witham. It was once an important seaport, but the Wash is now so shallow that only small ships can get in.

The Welland flows through a rich agricultural district, but has no important towns on it. The district round its mouth is called Holland.

The Nen has two fair-sized towns on it, one a county town, Northampton, and the other a cathedral city and railway junction, Peterborough. The former is the chief centre in England of boot manufacture, which is also carried on in numerous small towns in the neighbourhood. Peterborough has an extensive brick-making industry.

The towns on the Great Ouse are agricultural market towns, of which Bedford is the most important. Ely is only remarkable for a splendid cathedral. The small port of King's Lynn is near the mouth of the Ouse. Its history is like that of Boston (see above). Cambridge, on the Cam, the chief tributary of the Great Ouse, is the seat of a famous university.

EAST ANGLIA AND ESSEX

111. East Anglia contains the two counties of Norfolk and Suffolk. Essex is of very similar character. The region consists of a wide coast plain rising gradually to a chalk ridge of no great height—a continuation of the Chiltern Hills—dying down towards the north, and ending in low cliffs near Cromer. The plain is covered to a considerable depth with boulder clay, deposited by glaciers during the Ice Age. This clay is extremely fertile, and East Anglia grows more wheat in proportion to its area than any other part of the British Isles. Not only the land but the climate also is favourable to wheat production. The rainfall is small and the summer is hotter than in the rest of England. The winters are cold, but this does not affect the growth of wheat.

The coast is generally low and sandy, except in the north of Norfolk. In Essex and Suffolk the sea has “drowned” the lower valleys of the rivers Orwell, Stour, Blackwater, etc., forming long inlets. The rivers Waveney, Yare, and Bure unite in one mouth near Yarmouth. The Bure and its tributaries expand near the coast into numerous shallow lakes called the *Broads*.

Norwich is the largest town of the whole region. It is an old cathedral city, once a port, now a great corn and sheep market, with some manufactures, *e.g.* of mustard and starch, connected with agriculture.

Yarmouth and Lowestoft, the most easterly towns in Britain, are chiefly engaged in the herring fishery of the North Sea, and are also “pleasure towns.” Ipswich is a town of similar character to Norwich, and also makes agricultural machinery. Harwich, though a small town, is an important port, carrying passengers and perishable goods to and from the Hook of Holland, Flushing, and Antwerp. There is a train-ferry from Harwich to Zeebrugge. Colchester is famous for oysters, and is an important military station.

Locate all the above-named towns, and state on what rivers or estuaries they are situated.

THE THAMES BASIN

112. The Thames rises in the limestone ridge of the Cotswold Hills. Just before reaching Reading the river flows

through a wide gap between chalk hills, the Chiltern Hills on the left and the Marlborough Downs on the right. The upper basin of the river, between the chalk and the limestone, is a wide clay plain with the old university town of Oxford in the middle of it. The river Cherwell, from the Northampton Heights, joins the Thames here. The Morris motor works are at Oxford.

One of the chief towns in the upper Thames basin is Swindon, in the north of Wiltshire, where the engineering works of the Great Western Railway are situated. The town is only three or four miles from the watershed between the Thames and the Bristol Avon. The older main line of the G.W.R. crosses the watershed at a height of 330 feet. Why does this line make such a large bend to the north between Reading and Swindon, and then a large bend to the south between Swindon and Bristol?

The river Kennet joins the Thames just below the gap in the chalk near Reading, an ancient town which manufactures biscuits and grows seeds. About halfway between Reading and London stands Windsor, with its famous royal castle. The river Colne joins the Thames from the north just below Windsor, and the river Lea joins it in East London. London draws part of its water supply from the latter river, the remainder being chiefly obtained from the Thames itself.

113. The lower Thames (*i.e.* below Reading) is said to be surrounded by a "wall of chalk," except on the east (Fig. 38). On the north are the Chiltern Hills, on the west the Marlborough Downs, and on the south the North Downs. It is a remarkable fact that not only the main river, but most of its chief tributaries, rise, not in this "wall" of chalk, but beyond it. The steeper side of the hills, both on the north and south, faces away from the river, and the slopes of the Thames valley itself are very gentle. The valley is covered with clay, sand, and gravel of various kinds, lying on top of chalk.

To the north of the lower Thames, in Berks and Bucks, there are large areas of woodland, chiefly beech. This has given rise to an important chair-manufacturing industry in High Wycombe and other places.

The Wey and Mole are the chief tributaries from the south between Reading and London. These rivers flow through

the North Downs in narrow gaps, occupied by the towns of Guildford and Dorking. Further east two other rivers also flow through gaps in the Downs, the Medway into the Thames estuary and the Stour into the North Sea (Fig. 36).

To the west and south-west of Windsor, between the Thames and the Hampshire Downs, is a hilly area of barren, very sandy soil (called the Bagshot Sands) occupied by heaths and pinewoods. On this area is the great military station of Aldershot, about midway between London and Southampton, the great port of embarkation for foreign service. The position was chosen because the ground, though unfit for agriculture, is admirable for manoeuvring. The other great training ground of the British Army is on the east side of Salisbury Plain—also on somewhat barren ground and within easy reach of Southampton.

LONDON AND THE THAMES ESTUARY

114. The lower Thames was in early days surrounded by a good deal of marshy ground, liable to be flooded at high tide. London is the lowest place where firm ground approaches near the river on both sides, and hence the Romans made there the first bridge. As soon as the bridge was made, it marked the limit of sea-navigation, and hence London became a seaport, commanding both the entrance to the Thames valley and the easiest routes from south-eastern England to the north.

London has increased continuously in size and importance with the expansion of England, first into the United Kingdom and then into the British Empire. It is the seat of government both of the Kingdom and the Empire, the greatest commercial centre and seaport in the world, and owing to its already existing importance it controlled the development of the main railway lines of the country, which radiate from it like the spokes of a wheel (Fig. 38).

The old City of London (about one square mile in area) is now a place of banks and offices, with a very small resident population (about 20,000). The County of London contains parts of the old counties of Middlesex, Surrey, and Kent, and was separated from them and made a new county about 1890. It has an area of 120 square miles, and a population of 4½ millions. Beyond this is a belt of suburbs called the Outer

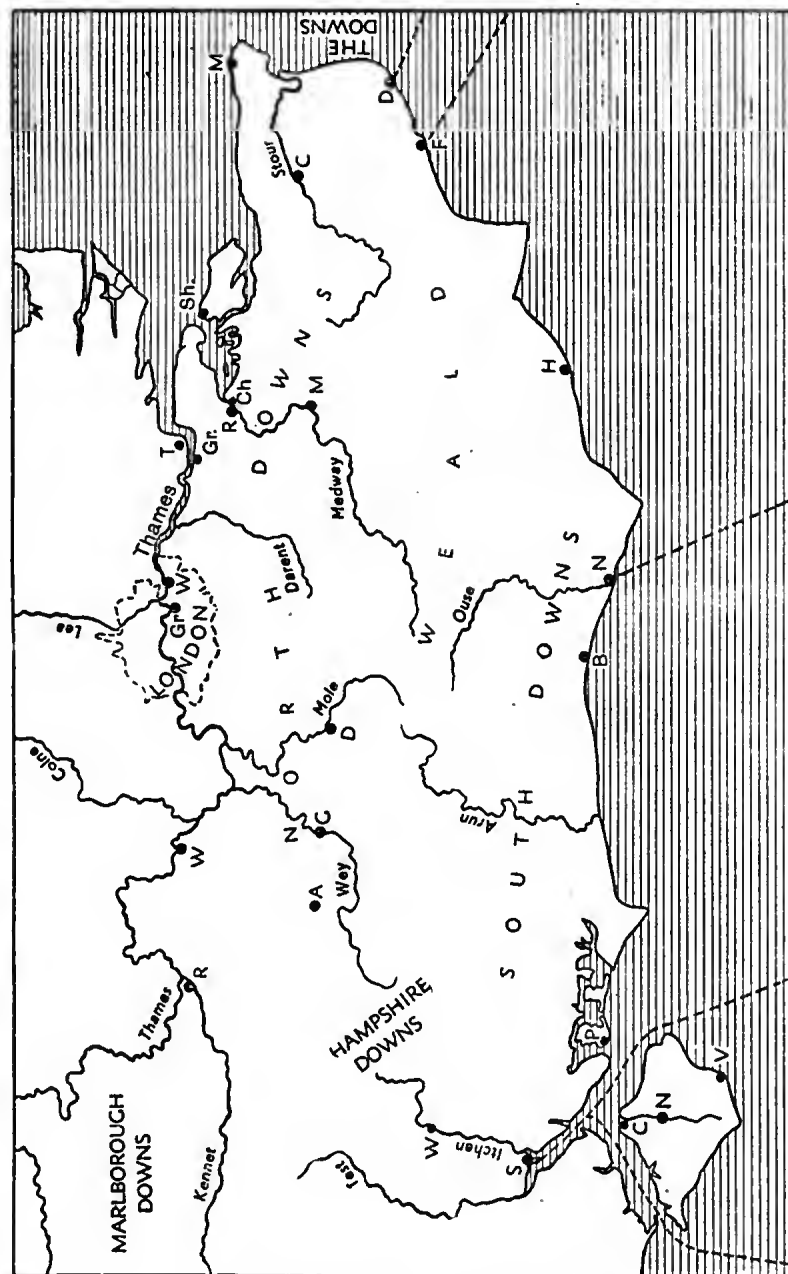


Fig. 36. THE LOWER THAMES AND THE SOUTH-EAST.

Ring. "Greater London," which includes the City, the County, and the Outer Ring, has a population of over eight millions, considerably greater than the population of Ireland, Scotland, or Australia. The Outer Ring is in four different counties.

115. This vast population is chiefly engaged in commercial pursuits, the buying, warehousing, and selling of goods of all kinds from all over the world, and in finance (banking, insurance, etc.). The "City" is the business and financial centre of the world. The east of London has not only the docks of the greatest port in the world, but is a great manufacturing centre, making soap, jam, pickles, and innumerable other articles. Westward of the City is the old royal city of Westminster, the centre of the British Government, and this Government employs many thousands of people in the "Civil Services."

It should also be remembered that London is the chief British centre of retail trade (shopping), and of art, science, fashion, and luxury, with the many people employed by them, directly or indirectly. Most of the important newspapers of the country are printed and published in London, which probably publishes also more books than all other British towns put together, though much of the printing is now done outside London.

Many more thousands of people are employed on railways (mostly underground), trams, omnibuses, cabs, etc., and in the management of hotels, which have been built in consequence of the great modern development of travelling.

Owing to the wide distribution of electrical power, it is not now so necessary as it was for factories to be on or near to coal-fields. Many industries have in recent years been attracted to "Greater London" or its neighbourhood. Thus the Ford motor works have been removed from the north of England to Dagenham, just outside London.

116. The Port of London extends down the river for about thirty miles below the city. Most of the docks are between the Tower and Woolwich. The imports come from all over the world, and consist chiefly of food-stuffs, coal (from other parts of England), raw wool, leather, and rubber. The exports, which go chiefly to Europe, Australia, and the East

(the American trade is chiefly conducted by Liverpool, Glasgow, and Bristol), consist of manufactured goods of all kinds, and of imports (wool, rubber, tea, coffee, leather, etc.) re-exported. A port which thus receives goods from one country and then distributes them to others is called an *entrepôt*.

117. The Essex side of the Thames estuary is very low and marshy, and has no towns on it of any importance except **Tilbury**, where the lowest docks are. On the south side higher ground comes considerably nearer the river, and affords suitable sites for towns. Greenwich, where the Observatory marks the Zero Meridian, and Woolwich, where there is a great government arsenal, are now in London itself. Gravesend is the point where the most direct road from Dover to London, along the foot of the North Downs, strikes the Thames. Chatham, where this road crosses the Medway, has naval dockyards and shipbuilding works.

The island of Sheppey, separated only by a narrow creek from the mainland, lies at the mouth of the Medway. The town at the extreme north of the island, Sheerness, is another naval centre, with dockyards and fortifications. Queenborough, near it, sends passenger steamers to Flushing, in Holland.

THE SOUTH-EAST

118. Trace out on a physical map the watershed through Kent, Surrey, and Sussex, separating the rivers flowing into the Thames and its estuary from those flowing into the English Channel. Notice the remarkable fact that this watershed is almost everywhere on low ground, almost midway between the North and South Downs, which run eastward from the Hampshire Downs.

The *Weald* (Fig. 36) is the horse-shoe shaped area enclosed by the Downs just mentioned and by the sea between Beachy Head and Dover. It is a shallow basin with a slight uplift in the middle called Ashdown Forest. The chalk downs all have their steeper slopes facing inwards towards the Weald.

The Weald was once densely forested (in Old English the name weald meant a forest), and even now contains a higher proportion of woodland than the rest of England. In days

when charcoal was used for smelting iron-ore it was a great iron-making district, but this industry has migrated to the coal-fields. The Weald, particularly the Kentish part of it, is now the chief fruit and hop-growing area in England. Kent also contains more sheep in proportion to area than any other English county, the Downs forming excellent pasture land.

Note the positions of Guildford, Dorking, Sevenoaks, and Maidstone in relation to the gaps cut through the North Downs by the rivers of the Weald. These places either are or were fortified to guard the routes to the Thames valley from the south coast.

The rivers Arun, Adur, and Ouse have, in the same way, cut gaps through the South Downs. The castles of Lewes and Arundel show the former importance of those places. Newhaven, near the mouth of the Sussex Ouse, sends steamers daily to Dieppe. Between the mouths of the Ouse and Adur stands Brighton, the largest pleasure-town in the kingdom.

119. The North and South Downs end in bold white cliffs between Dover and Folkestone and at Beachy Head respectively. The Weald coast between these points is mostly low. Dungeness is merely a long bank of shingle, heaped up in ridges by the tidal currents from the west. It has been formed within historical times, and is still growing seaward. Behind Dungeness is Romney Marsh, once an arm of the sea, but now filled up by silt from the Rother. Eastbourne, Hastings, and Folkestone are the chief pleasure-towns of the Weald coast.

The French ports of Calais and Boulogne are connected by daily steamers with Dover and Folkestone respectively. Dover is particularly important as the chief gateway into England from the Continent. In early times, when the Weald Forest was almost impenetrable by armed forces, the only easy road from the south-east to London was the road from Dover.

Near the North Foreland, in the north-east of Kent, are the pleasure-towns of Margate and Ramsgate, on the "Isle" of Thanet. This was once really an island, but it has been joined to the mainland by silt brought down by the river Stour, on which stands **Canterbury**, the ecclesiastical capital of England. The mouth of the Stour has been moved several miles to the north, by the building up of a shingle bank

across its former mouth near Sandwich, which is now an inland town. In the sea a few miles out from Sandwich and Deal are the dangerous *Goodwin Sands*; the deeper water between them and the shore is known as the Downs.

THE HAMPSHIRE BASIN

120. From near Selsey Bill to a little west of Poole Harbour is a low plain of sand and clay, almost completely surrounded, like the London Basin, by a belt of chalk downs. In the central widest part of the plain is the *New Forest*, one of the few ancient forests left in England.

In the south-west of the area is the "Isle" of Purbeck (really a peninsula) with cliffs of chalk and limestone. Except in Purbeck the coast of the Hampshire Basin is low, with numerous shallow inlets.

A channel called the Solent, from two to four miles wide, separates the Isle of Wight from Hampshire. A part of the eastern branch of the Solent is a naval anchorage called Spithead. The island is fairly low in the north, like the mainland opposite, but the south is composed principally of chalk hills. At the west of the island a row of chalk "stacks" or pinnacles, called the Needles, stands up in the sea, which is wearing them away.

The chief rivers of the Hampshire Basin are the Frome, flowing into Poole Harbour, the Test, into Southampton Water, and the Wiltshire Avon, flowing nearly due south from the Marlborough Downs across Salisbury Plain.

All the large towns of the Hampshire Basin are on the coast. Poole exports large quantities of white clay to the Potteries. Bournemouth is a famous health resort. **Southampton** is the chief commercial and passenger port of the south of England. It sends daily steamers to Havre, and has a large trade with the west of Europe, Africa, America, and Australia. It is also a packet-station for Cherbourg, St. Malo, and the Channel Islands. It has the remarkable advantage of four tides a day, instead of the usual two (Art. 73).

Portsmouth is the great naval station of England, the headquarters of the Home Fleet. It has a "bottle-necked" harbour, immediately to the north of which is a chalk ridge, Portsdown, on which are placed fortifications commanding the entrance to the harbour.



W. H. F. Taylor.

BURSLEM, STAFFS. CANAL IN THE POTTERIES.

The round towers on the right are the kilns in which the soft clay, after being shaped, is hardened by heat.

The Solent is a favourite yachting place, and small ships are built at Cowes, in the north of the Isle of Wight. Ventnor and Newport are health resorts on the island.

The chief inland towns of the Hampshire Basin are Salisbury (in Wiltshire) on the southern edge of Salisbury Plain, at a point where several fertile valleys meet; and Winchester, at a gap in the downs cut by the Itchin. Both are old cathedral cities and market towns.

121. *Salisbury Plain* is rather a plateau than a plain, most of it standing 400 or 500 feet above the sea. Its rivers, unlike the rivers of a plain, flow in rather deep narrow valleys. The plateau is very dry, and, like the downs, grows little but short turf. On the north the fertile Vale of Pewsey separates Salisbury Plain from the Marlborough Downs.

There are no towns of any consequence except Salisbury, already mentioned. The famous prehistoric monument of Stonehenge is about five miles north of Salisbury.

THE SOUTH-WEST

122. This region includes the long peninsula stretching W.S.W. from the Dorset Downs, which edge the Hampshire Basin on the west, to Land's End.

From the Isle of Purbeck to Land's End the coast is almost everywhere high and rocky. A railway map shows that one can go by train from Dover to Bournemouth without ever going far from the sea, because the coast is generally low. But in the south-west the coast is so bordered by cliffs, with occasional deep narrow valleys where rivers reach the sea, that the railways have to go a long way inland, and the routes between the ports are very circuitous. Trace out on a railway map the routes from Weymouth to Bridport, Bridport to Lyme Regis, and Lyme Regis to Sidmouth.

Going west from Purbeck we come to the pleasure-town of Weymouth, which sends steamers to the Channel Isles. Just south of this is Portland "Isle," now, like Purbeck, a peninsula. It is joined to the mainland by a remarkable bank of shingle, the Chesil Bank, about 10 miles long and 200 yards wide at low water. Portland Isle is famous for building stone. On the north of the island a breakwater protects a splendid naval harbour.

town of **Bath**, famous for its mineral waters and for building-stone. About ten miles lower down, at Clifton, the river flows through a still narrower gorge, spanned by a famous suspension bridge.

Clifton is a suburb of the great seaport of **Bristol**, which was in the Middle Ages the second town in England, while Liverpool was yet a village. Bristol does a large trade with Ireland in dairy produce and meat, and also imports, chiefly from North America or the West Indies, fruit, tobacco, sugar, wheat, petroleum, timber, and cocoa. As the Avon is too shallow for modern ships, new docks have been made at **Avonmouth**. There are small coal-fields both north and south of Bristol, supplying fuel for its industries, which are mostly connected with food and tobacco.

The "West of England" woollen manufacture is carried on in the upper part of the Avon valley at **Bradford** and **Trowbridge**, and also farther north at **Stroud** in the Cotswolds. The industry arose in this district on account of the excellent sheep pastures of the Cotswolds and the Wiltshire Downs, but it has not grown to such large proportions as the Yorkshire industry, because there is no large coal-field very near.

THE SEVERN BASIN

126. The *Severn* is the largest westward-flowing river of Great Britain. It rises in **Plynlimmon** and its course is approximately a semicircle. Unlike the Thames, which is a county boundary almost throughout its course, the Severn is nowhere a boundary, except at its mouth.

The river flows down a narrow mountain valley to **Welshpool**, where it becomes navigable and emerges on to a fairly wide plain in which stands the ancient market town of **Shrewsbury**. A few miles lower down, at **Coalbrookdale**, in the Shropshire coal-field, the valley again becomes almost a gorge, having the isolated peak of the **Wrekin** on the north and the straight ridge of **Wenlock Edge** on the south-west.

Near **Kidderminster** (a carpet-weaving town) the narrow valley once more opens out into the wide low plain which stretches down to the estuary. This plain lies between the Cotswold Hills on the east and the Malvern Hills and Forest of Dean on the west. The old cathedral town of **Worcester**

has an important china manufacture, and **Droitwich** has valuable rock-salt mines. Between Worcester and Gloucester the Severn is joined by its two most important tributaries, the Warwickshire Avon from the Northampton Heights and the Teme from the uplands of central Wales.

The valley of the Avon is a pastoral, well-wooded district with old market towns at **Warwick**, **Stratford**, **Evesham**, and **Tewkesbury**. Its only large town is **Coventry**, which has an ancient silk manufacture, but has in recent years become one of the chief English centres for cycles and motor cars.

127. The plain of the Severn-Avon grows much fruit, especially plums and apples. On opposite sides of the plain lie the inland health resorts of **Malvern** and **Cheltenham**, both with mineral springs. The largest town of the plain is **Gloucester**, which is connected by a ship canal with the Severn estuary (the very high tides are a disadvantage to navigation on the river itself) and imports grain and timber for the Black Country. In early times Gloucester was important as the lowest bridge town on the Severn, commanding all the routes into South Wales; but the river is now bridged some fifteen miles lower down, and lower still is crossed by a railway tunnel about five miles long.

The great length and funnel-like shape of the Severn estuary makes its tides the highest in the British Isles. Spring tides at the mouth of the Bristol Avon have a height of about forty feet.

The tidal wave from the Atlantic is compressed between ever narrowing shores, and at spring tides the front of the wave becomes a definite wall of water, called a bore, two or three feet high, advancing swiftly up the river. The river Trent also has a well-defined bore, known locally as the eagre.

WALES

128. Wales consists chiefly of a block of highland of old hard rocks occupying almost the whole country. In **Pembroke**, in the Carnarvon peninsula, and in **Anglesea** the highland has been worn down into plains. **Menai Strait** separates Anglesea from the mainland. Two bridges cross this strait, carrying a road and a railway. On an island to

the west of Anglesea is the important passenger port of Holyhead, only about 60 miles from Dublin.

The highest mountain in Wales, *Snowdon* (3,560 feet), is not far from Menai Strait. The Snowdon group of mountains has enormous slate quarries at Llanberis, Portmadoc, etc. The slates are exported chiefly from Carnarvon and other small ports near it.

The chief rivers of North Wales are the Conway, Clwyd, and Dee. The largest of these, the Dee, is, in its lower course, partly English. In its upper valley is the only large natural lake in Wales, Lake Bala, but farther south are two large artificial lake-reservoirs, Vyrnwy and Elan, on tributaries of the Severn and Wye respectively, supplying Liverpool and Birmingham with water.

North Wales is much visited by tourists on account of its fine scenery. Llandudno, on the low ground connecting Great Orme's Head with the mainland, is the largest of the pleasure-towns. There are small coal-fields in Flint and Denbigh, where the presence of lead and zinc ores give rise to metallurgical industries. Wrexham and Mold are the chief towns of this district.

129. Central Wales has a very small population and no large towns. It is a land of mountain and sheep pasture. The main watershed is only about 10 to 15 miles from the coast, and therefore the long rivers all flow eastward. The chief heights are *Cader Idris* (2,900 feet) and *Plynlimmon* (2,500 feet), both in the west. The Wye and Severn both rise in Plynlimmon. The Teifi is the only long river in Wales lying west of the main watershed, and its course is mostly parallel to the coast at a distance of about 10 miles. Aberystwyth and Barmouth are pleasure-towns on the coast. The former also has one of the four university colleges in Wales. The others are at Bangor, Cardiff and Swansea.

130. In South Wales (Fig. 37) the chief elevations are the *Brecon Beacons* (2,900 feet) and the *Black Mountains* (2,600 feet). They are separated by the narrow valley of the Usk.

The chief rivers entering the Severn estuary from Wales, and the towns at or near their mouths, are the Wye (Chepstow), Usk (Newport), Taff (Cardiff), Neath (Neath), Tawe (Swansea), and Towy (Carmarthen). The Wye, after leaving

the Welsh mountains, enters the fertile plain of Hereford, famous for its orchards and cattle. The river then enters a limestone table-land called the *Forest of Dean* (containing a small coal-field), and intersects it in a beautiful deep gorge between Ross and Chepstow.

131. South Wales is chiefly important on account of the great coal-field which lies in the hilly country between Brecon Beacons and the coast plain of Glamorgan, and extends from near Newport to beyond Llanelly, while a detached portion of it lies still farther west in Pembrokeshire. On account of the coal-field, the county of Glamorgan, which is less than one-ninth of the area of Wales, contains more than half of the whole population.

The nature of the country, with many valleys all leading southward, greatly assists communication with the coast. The parallel valleys also made it possible to work the coal cheaply, by cutting galleries horizontally into the hillsides, instead of sinking the usual deep shafts. The chief mining valley is Taff Vale, with the tributary valley of the Rhondda. The chief inland town is Merthyr Tydvil. At the mouth of the Taff is Cardiff, the largest town in Wales. It exports vast quantities of coal, especially anthracite or steam coal, for use on ships, but the amount exported has decreased considerably in recent years, owing to the increasing use of oil-fuel in ships. Barry Dock, a new town a few miles south of Cardiff, is more accessible to steamers. Near the other end of the coal-field is Swansea, which also exports coal, but is chiefly engaged in smelting metallic ores, particularly copper. The copper at first came principally from Devon and Cornwall, but now comes from the United States, Spain, Mexico, and other countries. Swansea also makes tin-plate and zinc-plate (*i.e.* sheet-iron coated with tin or zinc), and has works for refining crude petroleum.

There are large iron works, using imported ore, at Merthyr Tydvil, Cardiff, and Newport.

In the lowland peninsula of Pembrokeshire there is a naval dockyard at Pembroke Dock, on the sheltered waters of Milford Haven. On the north coast of Pembroke Fishguard has been made by the Great Western Railway into a port for swift passenger traffic with the south of Ireland. Some Atlantic liners also call at Fishguard.

THE CHESHIRE PLAIN

132. This plain is the wide low gap between the southern end of the Pennine Chain and the Welsh mountains. It is traversed by the Dee on the west and the Weaver, a tributary of the Mersey, on the east. The plain is rich grazing land, and Cheshire has more cattle in proportion to its area than any other English county. It is famous for its cheese.

There are important mines of rock-salt in the Weaver basin at Northwich, Middlewich, and Winsford. The salt is obtained chiefly by flooding the mines with water, pumping up the brine and evaporating it.

Chester was once important as a seaport for Irish traffic and as a fortress guarding the north coast route into Wales. The silting-up of the Dee estuary has deprived it of its importance as a seaport, but, as is often the case with old fortresses (*e.g.* York, Carlisle, Perth), it is now a great railway junction.

Even more important as a railway junction is Crewe, where the engineering works of the London Midland and Scottish railway are situated.

RAILWAYS

133. The railways of Great Britain have a total mileage of about 20,000 miles, not including double and quadruple tracks. All the lines except a very few "light" railways have the "standard" gauge of 4 ft. 8½ in. between rails, so that an engine, passenger coach, or truck can travel if necessary from one system to another. The railways represent a capital expenditure of over a thousand million pounds.

British railways are divided into four large groups, which were formed in 1923 by the amalgamation of a great number of railway companies previously working independently of each other.

134. London was already so important before the beginning of the railway era (1825) that it controlled all the main railway lines, which radiate from London like the spokes of a wheel (Fig. 38). The lines to the north-west mostly find convenient gaps in the Chilterns, but some of the southern lines have had to tunnel passages through the North and South Downs.

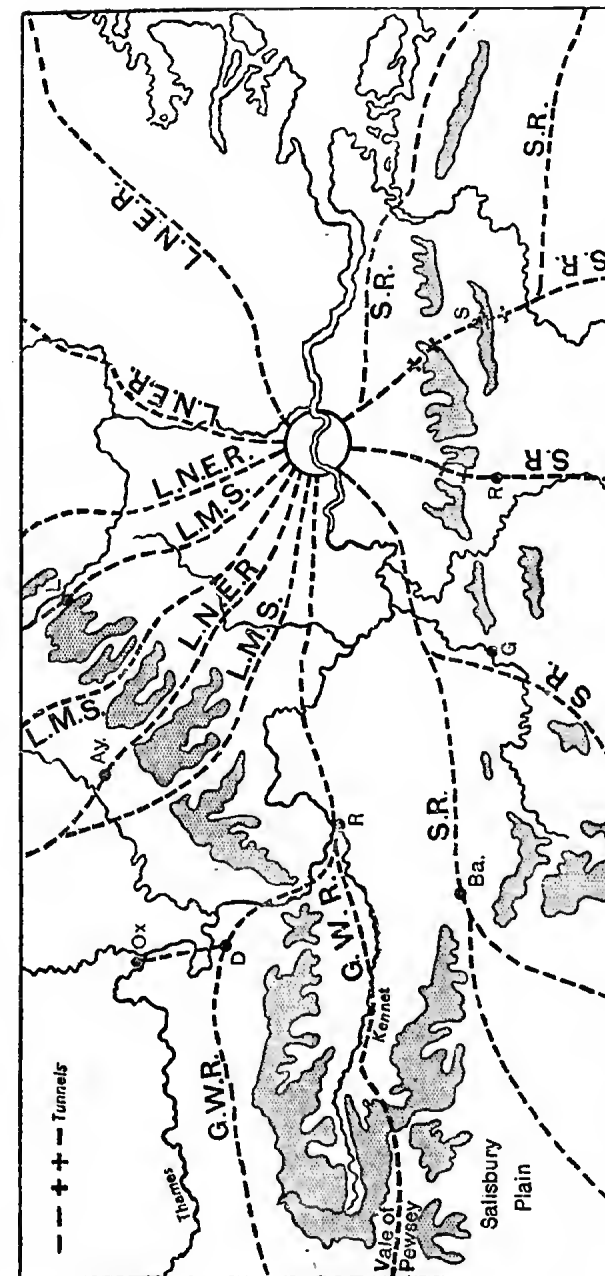


Fig. 38. RAILWAYS FROM LONDON THROUGH THE GAPS IN THE CHALK.

Many lines near London have been electrified in recent years, but long-distance trains still run on steam, and many expresses exceed 60 miles per hour. The longest "non-stop" runs are King's Cross to Edinburgh, 392 miles, and Euston to Carlisle, 299 miles. The latter train has been running from Euston Station daily at 10 a.m. since 1848.

135. *The London Midland and Scottish railway (L.M.S.)* covers 6,940 miles, more than a third of the total railway mileage of Great Britain.

The L.M.S. has two main lines northward from London (St. Pancras and Euston Stations). It covers a large area of the Midlands, and the whole of the north-west of England, with an important line through North Wales to Holyhead. It includes most of the Scottish railways except in the south-east of that country, which is served by the London and North Eastern Railway. The L.M.S. has railway engineering works at Derby and Crewe, both of which are near the middle of the system and are important junctions.

Of the two main L.M.S. routes from London to Carlisle, the eastern one via Leeds is the most difficult. From Leeds there is a long climb up the Aire valley, through the Aire Gap, and up the Ribble valley to its head. On the high watershed between the Ribble and Eden the line reaches a height of 1,160 feet, and then has a long run down the Eden valley to Carlisle. The western main line avoids the Pennines altogether, running through the Cheshire Gate at Crewe on to the Lancashire plain, but then has to climb over Shap Fell, 1,000 feet, before converging with the other line at Carlisle.

136. In Scotland the L.M.S. has two main lines, connected by numerous branches, from Carlisle to Edinburgh and Glasgow. Farther north it runs centrally through the Highlands, via Stirling and Perth, reaching the highest point of British railways (about 1,500 feet) at the Drumochter Pass (Dalwhinnie Station). It reaches the far north at Wick and Thurso, with several large deviations due to the rugged character of the country, and has branches westward reaching the sea at Oban and at the Kyle of Lochalsh, from which ferry steamers run to the Hebrides.

The Welsh line of the L.M.S. is important because of the steamship connection Holyhead to Kingstown, for Dublin.

North Wales is so mountainous that the main line keeps close to the coast after Chester. It crosses to the Isle of Anglesea by the famous Menai Tubular Bridge.

In the English Midlands the system is far too complicated for description, almost every considerable town being a junction of several branches. An important branch runs southward from Birmingham to Bristol and Bath, in both places connecting with the Great Western system by joint stations.

Two branches of the L.M.S. traverse the southern part of the Pennine Range through very difficult country, connecting Sheffield and Derby respectively with Manchester. The Totley Tunnel (more than $3\frac{1}{2}$ miles), on the Sheffield-Manchester branch, is the longest in the country except the Severn Tunnel on the Great Western.

137. *The London and North Eastern railway (L.N.E.)* (6,369 miles) covers, broadly speaking, all the eastern side of England north of London, and, through Berwick, connects with a considerable network of lines in central Scotland and in Aberdeenshire. Its chief London termini are Liverpool Street, King's Cross, and Marylebone. The first of these, apart from long-distance traffic, serves a large suburban area of outer London, and is reputed to be the busiest station in the world, with over 200,000 passengers daily.

The L.N.E.R. covers the great agricultural area of East Anglia and Lincoln, part of the Yorkshire and Nottinghamshire coal-field, and the industrial Tyne and Tees area, from which much coal is carried southwards to London. Its main engineering works are at Doncaster.

138. The "East Coast" route to Scotland has far fewer natural obstacles to surmount than the western routes, being on lowland nearly all the way. It passes through Peterborough, Grantham, Doncaster, York, Darlington, Newcastle, Berwick-on-Tweed, to Edinburgh and Glasgow. It is only north of Newcastle that the line becomes literally an "east coast" route, being in this part quite near the sea except for a few détours inland to avoid rocky headlands. Berwick-on-Tweed is the eastern gateway of Scotland, as Carlisle is the western. A branch from Newcastle leads through the Tyne Gap to Carlisle.

North of Edinburgh the L.N.E.R. crosses the Firth of Forth by the great Forth Bridge, more than a mile and a half long, while the Firth of Tay is crossed by the still longer Tay Bridge, two miles long.

North of Glasgow a branch runs through the western Highlands round the north of Ben Nevis to Fort William, and thence to Mallaig on the Sound of Sleat, opposite the Isle of Skye.

The L.N.E. express trains between King's Cross and Newcastle do the journey of 268 miles at an average speed of 67 miles per hour—the fastest long-distance run in the country.

139. The *Great Western* railway (3,785 miles) more or less covers the area between the London-Plymouth and London-Chester lines. It touches Birmingham and the "Black Country," but apart from this has no great industrial district except South Wales. It has therefore on the whole fewer branches than the L.M.S. and L.N.E., though it serves a very large area. Its engineering works are at Swindon, on the main line between London and Bristol. The G.W.R. was originally a "broad gauge" line (6 feet), but its tracks were narrowed to standard gauge late in the nineteenth century, to enable its vehicles to connect with other lines. The London terminus is at Paddington.

140. The main Plymouth line (the route of the "Cornish Riviera Express") is via Reading, Newbury, Westbury, Taunton, Exeter, and then round the south side of Dartmoor to Plymouth, from which the line runs on to Penzance, near Land's End.

An older main line diverges from the Plymouth line at Reading, and goes via Didcot (branch for Oxford) and Swindon to Bath and Bristol, passing through the Cotswold Hills in the Box Tunnel, nearly two miles long. This was originally the main line to Plymouth, and some Plymouth trains still go via Bath and Bristol, but the fastest trains go via Westbury.

At Bristol the G.W.R. meets the L.M.S. in a very large joint station, and through trains frequently run from the L.M.S. system to the Devon and Cornwall seaside resorts. The goods station at Bristol (Temple Meads) is said to be the largest covered goods station in the world.

The main South Wales line crosses the Severn a few miles north of Bristol by the Severn Tunnel, nearly four and a half miles long, to Newport, Cardiff, Swansea, and Fishguard, where steamers connect with Rosslare in Ireland. There are numerous branches covering the South Wales coal-field.

The Severn valley and the North Wales coal-field are mainly served by the G.W.R., which reaches as far north as Chester.

141. The *Southern* railway (2,156 miles) has a smaller mileage and covers a smaller area than any other of the four railway groups, but is nevertheless a very important system. It covers the area south of the London-Exeter line, with some minor extensions into Devon and Cornwall round the north side of Dartmoor. Its chief London stations are Waterloo, Charing Cross, and Victoria.

The S.R. serves all the cross-Channel ports of the south and south-east of England, and is thus of special importance for travel to the Continent. It also serves Aldershot and Salisbury Plain, the chief centres of the British army, and Southampton, the chief port of embarkation for foreign service, and is thus the chief military line. There is an immense suburban traffic from the nearer parts of Surrey and Kent, and a great traffic to the south coast watering places.

The main line from London to Exeter, through Salisbury, is a little more direct than the main G.W.R. line, but traverses higher ground and has steeper gradients.

142. The lines south from London have to negotiate both the North and the South Downs, which, though not very high, are steep on the sides facing the Weald. Some lines make use of gaps, but the Brighton line tunnels through the North Downs at Merstham, near Redhill, and through the South Downs at Clayton. The main line to Dover, via Rochester and Chatham, skirts the north edge of the North Downs, and has no serious obstacles to encounter, but the line from London to Tonbridge cuts through the North Downs at Sevenoaks in a tunnel nearly two miles long.

The S.R. has electrified about 350 miles of its lines in and near London.

QUESTIONS ON CHAPTER VII

1. On a map of England name and mark the boundaries of the six counties on the east coast between the Tyne and the Thames. Mark the Yorkshire and Lincolnshire Wolds; the rivers Trent, Wear, Yorkshire Ouse, and Great Ouse; Colchester, Durham, Grimsby, Harwich, Ipswich, King's Lynn, Norwich, Scarborough.
2. Name and indicate the positions of six towns in England (two for each industry) in which the following industries are carried on: cotton, hardware, ship-building, explaining why each locality has been chosen.
3. Draw a sketch-map of Wales. Also include and name the English counties which adjoin it. Insert the county towns of these English counties, and in Wales name and mark two river mouths, two bays, three mountain peaks, and three important towns.
4. Give the position and extent of two of the most important English coal-fields, name two towns situated in each of these districts, and mention their special industries.
5. Name four large towns (excluding London) which lie to the east of a line drawn from King's Lynn to Weymouth. Describe the position of each, and mention the causes which have favoured its growth. How do you account for there being so few large towns in this part of the country?
6. Describe the physical features and coast-line of that part of England lying south of the Bristol Channel and west of a line drawn from Bristol to Portland, giving the names and positions of two ports and two inland towns in the region.
7. Name three ports on the east coast of England, no two of them being in the same county; and show how the importance of each depends on its geographical position.
8. Describe briefly the courses taken by three rivers flowing from the Central Watershed of England north of the Peak. Name two towns on the banks of each river, indicate their positions, and state for what they are severally noted.
9. Describe the principal physical features and climatic conditions of the Lake District of northern England.
10. Write notes on the position and importance of any three of the following towns: Lincoln, Nottingham, Lancaster, Exeter, Durham.
11. Name three English towns—one for each industry—noted for making (1) woollen cloth, (2) earthenware, (3) marine engines; give the situation of each town, and mention any circumstance that helped to connect each industry with its particular town.

12. Name three of the rivers that flow into the Humber; mention one important town on each; state its chief industries, or other special feature; explain how the physical surroundings of each town influenced its development; name the railways that connect the three towns with London.
13. Name in order, state for what they are noted, and give an account of the industries of four important towns situated on (a) the London Midland and Scottish, (b) the London and North Eastern, lines from London to Scotland.
14. Draw a sketch-map of England from Hull to Portsmouth. Mark and name the rivers Medway, Witham, Yare, and one important town on each river; mark and name the Chiltern Hills, Dungeness, the Weald, Brighton, Grimsby, Winchester.
Which is the most direct railway route from London to Portsmouth? Mention one important town passed through on that route.
15. Trace one of the routes by which a traveller may pass within twenty-four hours from Dublin to Newcastle-on-Tyne, and mention the industries of the districts traversed in the land part of the journey.
16. Write a short description of Yorkshire (boundaries, physical features, and natural productions). Name four of its important towns, and state for what they are noted.
17. In what ways do physical features, climate, and occupations in the Fens differ from those in the Lake District?
18. Describe the import and export trade of three of the following ports: Bristol, Hull, London, Manchester.
19. Describe briefly the physical features of three of the following areas: Dartmoor, the Lake District, the North Downs, Snowdon district, the Wash.

CHAPTER VIII

SCOTLAND

GENERAL

143. Scotland is composed of three main divisions. If you draw straight lines on a map of Scotland (1) from Stonehaven to the middle of the island of Bute, in the estuary of the Clyde, and (2) from Dunbar to Girvan, on the coast of Ayrshire, you will have these divisions marked out with sufficient accuracy (Fig. 40). They are, from north to south, (1) the Highlands, (2) the Lowlands, or the Midland Valley, (3) the Southern Uplands.

Sometimes the two southern divisions together are called the "Lowlands." The name is rather misleading, as both divisions contain hills rising to over 2000 feet. There is, however, a much more marked difference between the Highlands and all the rest of Scotland than there is between the two divisions of the south.

The Highlanders of Scotland are a Celtic race. Some of them still speak the old Gaelic language, and a few are unable to speak English. In Caithness and in the Orkney and Shetland Isles the people are mainly of Scandinavian origin, descendants of the Norsemen. The people of southern Scotland are mostly, like the English, of Teutonic origin (Anglo-Saxon). The population of Scotland has approximately trebled during the last century, and nearly the whole of the increase has taken place in the Central Lowlands, especially in the Lothians, Lanarkshire, and Renfrewshire. Considerable portions of the Highlands—the counties of Argyll, Perth, and Sutherland—have actually decreased in population during the last century.

THE SOUTHERN UPLANDS

THE BORDER

144. The border-line between England and Scotland is made up chiefly of three natural features: (1) the lower course of the Tweed, (2) the Cheviot Hills (highest point the Cheviot, nearly 2,700 feet), and (3) the rivers Kershope and



SHIREBROOK COLLIERY, DERBYSHIRE.

The high framework near the middle in the background is the top of the "winding gear" above the shafts.

Liddel, tributaries of the Esk. The battlefields of Solway Moss, Otterburn, Homildon Hill, Flodden, and Halidon Hill are all within a few miles of the Border. Berwick and Carlisle are the two English gateways into Scotland at opposite ends of the line.

LAND-RELIEF AND RIVERS

145. The Southern Uplands consist mainly of round-topped grassy hills and wide level moors separated by wide valleys. The chief mass of high ground is in the middle, and rises to about 2,700 feet in Broad Law, Hart Fell, and Queensferry Hills, round the sources of three of the most important rivers, Tweed, Clyde, and Annan. The greater part of the Clyde basin, however, is in the Midland Valley (Art. 150). In the north-east of the Southern Uplands lie the Moorfoot Hills and the Lammermoor Hills, separated from the Broad Law group by the valley of the Tweed. To the south-west, around the sources of the Nith, Dee, and Cree, the land is on the whole lower and more broken, but Mount Merrick (2,760 feet) is the highest point in southern Scotland. The peninsula of Galloway is comparatively low, and on the other side of the country the Lower Tweed and the Teviot flow through a broad lowland between the Lammermoor Hills and the Cheviots.

PRODUCTIONS AND TOWNS

146. The grassy hills of the Southern Uplands, especially in the east, form the greatest sheep-run in the British Isles. The county of Berwick has 114 sheep and only six cattle per 100 acres. The chief industry is the weaving of "Tweed" cloth. Galashiels, Hawick, and Selkirk, all in the Tweed basin, are engaged in this industry.

In the south-west, where the country is lower and more open, and where there is more rainfall than in the east, cattle are more important. Thus Wigtown contains nearly three times as many cattle as Berwick, but less than half the number of sheep.

Name in order from east to west the Scottish rivers flowing into Solway Firth, and the small market towns at or near their mouths. Dumfries is the most important of these towns, and, like the towns in the Tweed basin, makes cloth.

The county of Dumfries contains good agricultural land in the valleys of the Esk, Annan, and Nith.

On the north side of the isthmus between Loch Ryan and Luce Bay is the port of Stranraer, which has regular steamship communication with the Irish port of Larne.

RAILWAYS

147. Three main railway lines join Carlisle with Glasgow and Edinburgh (Fig. 39).

(1) The "Waverley" route of the L.N.E.R. is the most easterly and most difficult of these. It tunnels through a spur of the Cheviots at a height of nearly 1,000 feet, crosses the low valleys of the Teviot and Tweed, and then crosses a pass 900 feet high between the Moorfoot and Lammermoor Hills. This line traverses the most picturesque scenery in southern Scotland. It passes through the "Scott country" between Teviot and Tweed, so called because it was the home of Sir Walter Scott, the author of the Waverley novels.

(2) The other two lines both belong to the L.M.S. system. The most direct line makes use of Annandale, and then runs down into Clydesdale. At Carstairs it divides into two branches for Glasgow and Edinburgh.

(3) The more westerly line makes use of the valley of the Nith, and its summit-level is only about 600 feet. A branch from Dumfries runs to Stranraer, whence there are daily steamers to Larne in Northern Ireland.

A network of lines covers the industrial and densely populated lowlands of Scotland, from Fifeshire to Renfrewshire. Those on the eastern side belong mainly to the L.N.E.R., those on the south and west of the lowlands belong to the L.M.S.

THE CENTRAL LOWLANDS

LAND-RELIEF AND RIVERS

148. The Midland Valley of Scotland consists chiefly of the lower basins of three large rivers, Clyde, Forth, and Tay, each opening into a large estuary, penetrating far into the land. Of these rivers the Tay is chiefly a Highland river, while about half the course of the Clyde is in the Southern Uplands, but the Forth is almost wholly a lowland river.

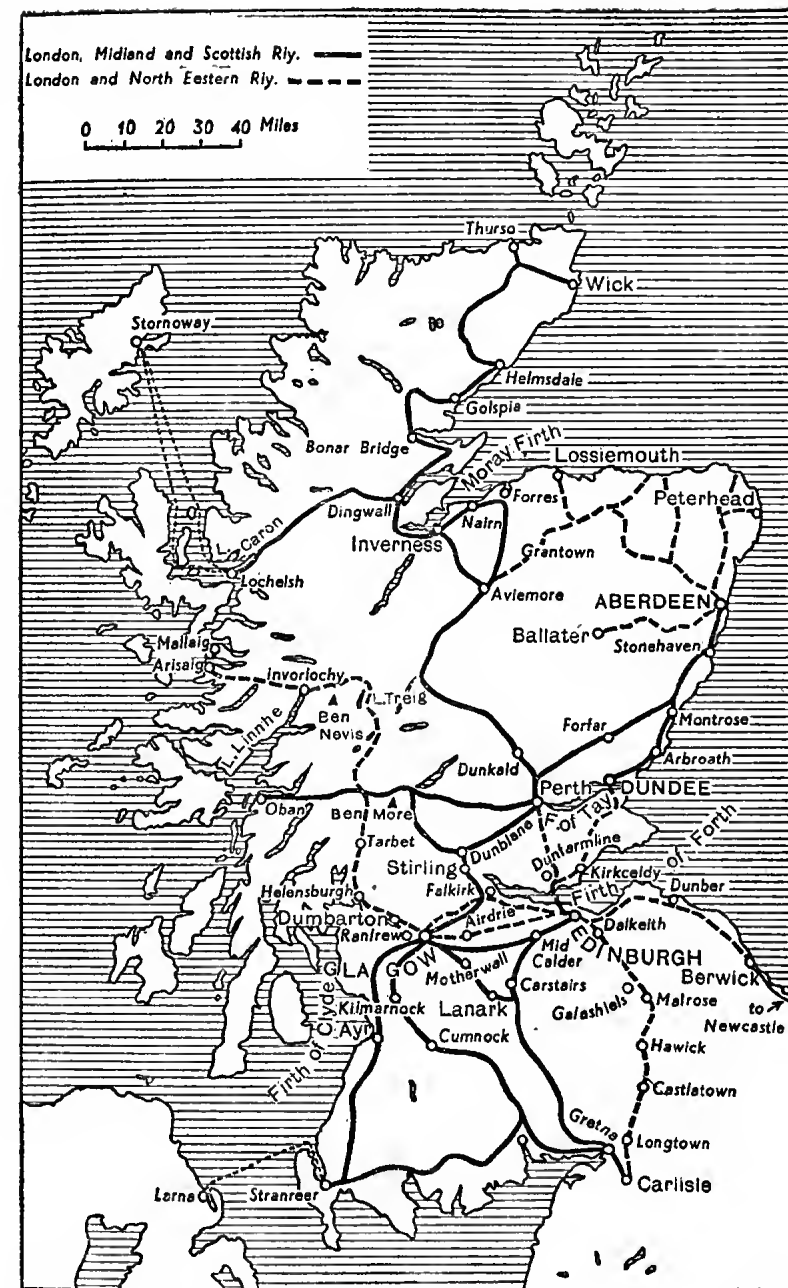


Fig. 39. SCOTTISH RAILWAYS.

A little north of the centre line of the Midland Valley is a broken line of volcanic hills stretching right across the country, in four divisions: (1) the hills of Renfrewshire, (2) Campsie Fells, between Clyde and Forth, (3) the Ochil Hills, between Forth and Tay, and (4) the Sidlaw Hills, north of the Firth of Tay. A few miles south of Edinburgh are the Pentland Hills, just on the edge of the Southern Uplands.

COAL-FIELDS

149. The Midland Valley of Scotland, though forming quite a small fraction of the total area of the country, contains

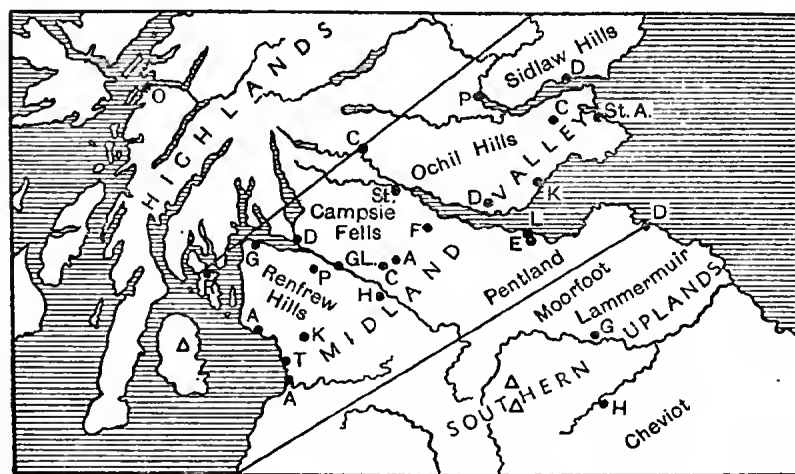


Fig. 40. CENTRAL SCOTLAND.

much more than half the population of Scotland, all the important coal-fields, and all the large towns with one exception (Aberdeen). There are three important coal-fields (Fig. 31).

(1) The Ayrshire coal-field occupies most of the northern part of the county of Ayr. Its seaports are Troon and Ardrossan, which send coal largely to the north of Ireland. The chief inland town of the coal-field is Kilmarnock, which manufactures railway materials.

(2) The Lanarkshire coal-field not only fills the northern half of the county of Lanark, but extends through Stirlingshire across the Forth to Clackmannanshire. It is the largest and most important of the Scottish coal-fields.

(3) The Midlothian and Fife coal-fields are probably the ends of one coal-field, the greater part of which lies under the Firth of Forth.

GLASGOW AND THE CLYDE

150. The Clyde rises in the middle of the Southern Uplands, and reaches the lowlands by a series of waterfalls (the Falls of Clyde) near Lanark. Then, after a short course across fertile country, famous for its horses, the river enters the Lanarkshire coal-field, and its lower course is through or near large manufacturing towns. Motherwell, Airdrie, and Coatbridge are chiefly iron-smelting towns. A few miles further west is Glasgow, the second city in the British Isles, containing over one-fifth of the whole population of Scotland. The river has been artificially deepened to enable large ships to reach Glasgow, which is a town of many industries, but chiefly of engineering and cotton manufacture. It is connected by canal with Grangemouth on the Forth.

Below Glasgow, the estuary of the Clyde (on both sides) is the greatest centre in the world of shipbuilding, the main occupation of Port Glasgow, Greenock, and Dumbarton.

A few miles west of Glasgow is Paisley, the chief centre of the manufacture of cotton thread.

151. The Firth of Clyde is the broad arm of the sea between Ayrshire and the Kintyre peninsula. It contains the islands of Bute, Arran, and the Cumbraes, which together constitute the county of Bute. They are much visited for their picturesque scenery. Rothesay in Bute is the chief tourist resort. The northern half of this island is really part of the Highlands. The mountains of Arran (*Goat Fell*, 2,800 feet) are a continuation of the line of hills extending from Forfarshire to Renfrewshire (Art. 148).

The only connection of the Clyde with the Highlands is furnished by the short river Leven, which flows out of *Loch Lomond* (45 sq. miles), the largest lake in Great Britain. The northern part of Loch Lomond is a typical highland lake, long, narrow, and deep, with very steep sides, *Ben Lomond* rising to 3,200 feet. The southern and wider half of the lake belongs to the lowlands. All the other lakes in Scotland, except Loch Leven in Fife, are purely highland lakes.

EDINBURGH AND THE FORTH

152. Only a small part of the river Forth lies in the Highlands. The river rises near Ben Lomond (3,200 feet), which overlooks Loch Lomond. The chief tributary is the Teith, which drains Loch Vennachar and Loch Katrine. The latter lake supplies Glasgow with water. A deep picturesque gorge, called the *Trossachs*, lies between Lochs Vennachar and Katrine.

The first important town on the Forth is **Stirling**, just below the junction of the Forth and Teith. The river here flows through a gap between Campsie Fells and the Ochil Hills. As this was also, till quite modern times, the lowest place where the river was bridged, the castle of Stirling, built on a steep crag overlooking the river, was formerly of great military importance. Several important battles have been fought in or near Stirling. Bannockburn is about two miles to the south.

153. **Edinburgh**, the capital of Scotland, also grew up round a castle on a steep crag of volcanic rock, commanding the narrow coast plain between the Pentland Hills and the Firth of Forth. Like most capitals, Edinburgh is a centre of printing and book-publishing, and many of the surrounding villages manufacture paper. There are also many breweries and distilleries. "Bituminous shale" is found in Linlithgow and Midlothian (and also on the other side of the Forth). The chief product of its distillation is paraffin wax for candles.

Leith is the port of Edinburgh, and the two towns are now continuous. The trade of Leith, like that of most eastern ports in Scotland, is chiefly with the Baltic countries, importing foodstuffs, timber, and wood-pulp for paper works.

The three counties of the Lothians (Linlithgow, Edinburgh, and Haddington) are fertile and well cultivated. No part of Scotland is really well favoured climatically for agriculture, but in the Lothians, Fife, and a few other small areas, heavy crops are raised by careful and scientific farming.

Formerly trains from Edinburgh to the north had to go a long way inland to Stirling, but a great bridge, the Forth Bridge, has been built across the estuary about six miles west of Edinburgh, and the distance from Edinburgh to Perth by train is now scarcely half of what it was.

At Rosyth, a little west of the north side of the bridge, a new naval station has been constructed, as a base for our North Sea Fleet.

Grangemouth, still further up on the south side, is the chief outlet on the east for the exports of Glasgow and other western towns. Falkirk, a few miles inland from Grangemouth, is an iron-smelting town. A little to the north of it are the famous Carron Iron-works, one of the oldest seats of the iron industry.

FIFE

154. The Fife peninsula lies between the Firths of Forth and Tay. There are two broken lines of hills, one along the north side and the other in the centre. The country is mainly agricultural, but in the south are two manufacturing towns dependent on the Fife coal-field (Art. 149). Dunfermline makes linen (importing flax from Belgium), and Kirkcaldy makes oil-cloth and linoleum, using jute and cork imported from India and Spain respectively. **St. Andrews**, on the east coast, is one of the four Scottish university towns (the others are Edinburgh, Glasgow, and Aberdeen), and is also famous for its golf-links. Cupar is an inland agricultural centre and the county town.

THE CARSE OF GOWRIE

155. The Carse of Gowrie is a small fertile plain lying between the Firth of Tay and the Sidlaw Hills. Though it is so far north, its sheltered position on a southern slope enables it to grow fruit for the jam factories of Dundee, which stands at its eastern end. The chief industry of Dundee, however, is the weaving of jute (from Bengal) into sackcloth and other coarse fabrics. There is also some linen manufacture, flax being imported chiefly from Belgium and Russia.

The Firth of Tay becomes narrower near its mouth, and the Tay Bridge crosses the Firth just opposite Dundee. This, like the Forth Bridge, is an important link in railway communications with the north-east of Scotland.

STRATHMORE

156. Strathmore is a longer and wider plain between the Sidlaw Hills and the edge of the Highlands. It extends

approximately from Perth to Forfar, and thus includes nearly all the lowland part of the course of the Tay, except the estuary.

Perth occupies with respect to the Tay a position similar to that of Stirling in respect to the Forth, and is the chief "gateway" to the Highlands. Once important as a military station, and in earlier times as the capital of Scotland, it is now a great railway centre (Fig. 39), thronged with tourists in summer. Owing to its abundance of pure water, Perth is also one of the chief centres of the dyeing, cleaning, and bleaching of textile fabrics.

THE HIGHLANDS AND ISLANDS

157. The Highlands are *not* a range or group of mountains, but the remains of an old plateau of hard rock, in which many rivers have cut deep narrow valleys, often containing beautiful lakes. A flat board laid upon a model of the country would touch, or nearly touch, a large proportion of the higher ground. The scenery of the Highlands is the grandest to be found in the British Isles. There are innumerable narrow valleys, or "glens," with steep sides, often forested, rising to wild bleak moors or in places to precipices, crags, and slopes of bare rock. The long narrow lakes which lie in many of the glens are of great beauty, as also are the western sea-lochs—old glens which have sunk below sea-level. The wider valleys of the lower rivers are called "straths."

The Highlands are split in two by the deep narrow valley of Glenmore (Fig. 41), which lies in an almost perfectly straight line from Loch Linnhe to Beaulieu Firth. The greater part of the valley is occupied by Loch Ness and Loch Lochy, from which rivers bearing the same names flow respectively north-east and south-west.

These lakes have been joined with each other and with the sea by the *Caledonian Canal*, which thus provides a waterway for small vessels right across Scotland. It is of no commercial importance, not being large enough for ocean-going steamers. Inverness, at the north end of Glenmore, is an important sheep-market. The names of Fort William, at the south end of the valley, Fort Augustus in the middle, and Fort George at the entrance of Beaulieu Firth, recall the former military importance of Glenmore. Fort William is now a tourist

centre, as it is the nearest village to *Ben Nevis* (4,400 feet), the highest mountain in the British Isles.

THE GRAMPIAN HIGHLANDS

158. Looking northwards from Strathmore, one sees what is, to all appearance, a lofty mountain range, called the "Grampian Mountains." In reality it is not a range at all, but merely the steep south-eastern edge of the Highland plateau. The name "Grampian" has been extended to all the south-eastern Highlands.

The greatest mass of high ground in the British Isles is found around the sources of the river Dee. To the north of the river are Ben Macdhui (4,300 feet), Braeriach, Cairngorm, and Cairntoul. To the south is a long wide ridge called the *Mounth*, which extends east and west for about fifty miles and is crossed by no railway and hardly any roads. The highest point is *Lochnagar*. The eastern end of the Mounth nearly reaches the sea at Stonehaven. At its western end is the Pass of Drumochter, nearly 1,500 feet high, a narrow gap by which the Highland Railway crosses from the valley of the Garry to that of the Spey.

In the valley of the Dee are the inland tourist and hunting resorts of Braemar, Balmoral (a royal residence), and Ballater, which, like nearly all the other inland towns of the Highlands, are no more than large villages. At the mouth of the Dee, however, is the large city of Aberdeen, which commands not only the coast route, but the valleys of both the rivers Don and Dee. Aberdeen is a great fishing port, an old University town, and exports cattle and granite from the Highlands.

159. The longest river of north-eastern Scotland is the Spey (nearly 100 miles), which runs nearly parallel with Glenmore. The smaller rivers Findhorn and Deveron follow nearly parallel courses on either side of the Spey.

The triangular area of land between the mouths of the Spey and the Dee is called Buchan. It is comparatively low, and, being sheltered by the Highlands, it has a fairly dry climate. It is the only part of northern Scotland capable of growing corn successfully. Its chief towns are Banff and Peterhead. The latter is a fishing town, and also exports granite.

The western part of the southern Highlands is much more broken up by valleys, lakes, and fiords than the eastern part. It contains the sources of the Forth and Tay, but is of little importance except as a tourist resort, and the population is extremely small. The chief tourist centre is Oban, on the coast. Its position makes it a natural centre of sea-routes in all directions.

The abundant water-power of the Highlands, either in the form of natural waterfalls or rapid streams, is being increasingly used for electric light and heat, and may lead to some

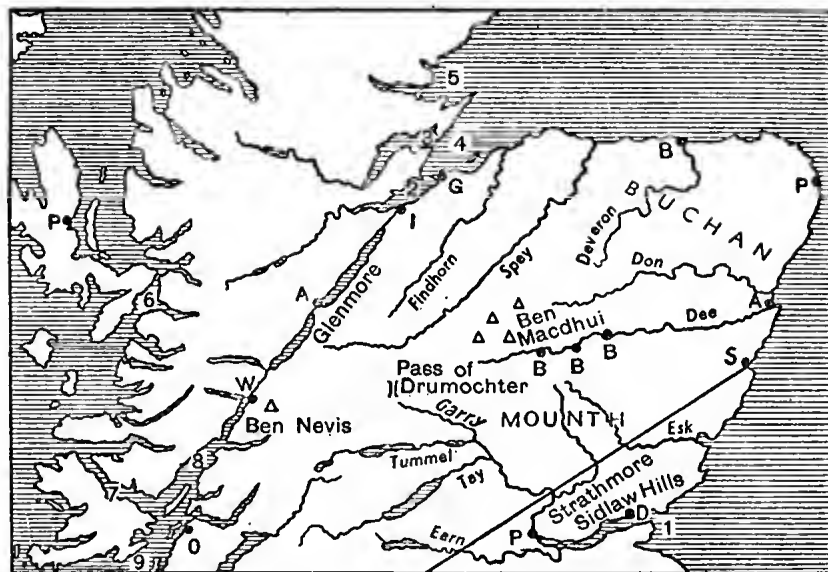


Fig. 41. SOUTHERN HIGHLANDS OF SCOTLAND.

industrial development. Works for the extraction of aluminium from its ores by electricity have been established at Foyers and Kinlochleven, making use of local water-power.

THE NORTH-WESTERN HIGHLANDS

160. North of Glenmore the Highlands are of less average elevation. There are still numerous mountains over 3,000 feet, but fewer large areas of high ground; the land is more cut up by glens. The rivers are very short and rapid, and there are many beautiful lakes. On the east side are several large but shallow gulfs—Beauly Firth and Cromarty Firth,

opening into Moray Firth, and Dornoch Firth. The west coast is so much cut up by narrow, steep-sided sea-lochs or fiords, that almost all communications are carried on by sea.

In the extreme north-east, in Caithness, is a small triangular area of agricultural lowland, containing the small fishing ports of Wick and Thurso.

The greater part of the Highland area consists of "deer forests," the word forest (as in Exmoor and Dartmoor "forests" in England) here meaning an open moor, with very few trees. The rivers are rich in salmon.

HIGHLAND RAILWAYS

161. The Highland railways belong mainly to the L.M.S. system, though the north-east corner in Aberdeenshire and Banffshire is served by the L.N.E.R.

The most important line (L.M.S.) runs from Perth, the "gateway" of the Highlands, up the valleys of the Tay and Garry, through the narrow gorge of Killiecrankie, and over Drumochter Pass (about 1,500 feet) into the Spey valley. This is left at Aviemore, and a very difficult section follows to Inverness. Farther north the line has to make great bends round the heads of the firths, and in Caithness to avoid the mountains of Morven. The northern termini are the small fishing towns of Thurso and Wick. A branch from Dingwall runs across the whole width of the country to the Kyle of Lochalsh, opposite the Isle of Skye.

The coast of Western Scotland, north of the Clyde, is only reached by railway at three points, viz. Lochalsh, just mentioned, Mallaig, and Oban.

Mallaig is at the end of a branch of the L.N.E.R. running north from Glasgow to the head of Loch Lomond, then across the high Rannoch Moor to Fort William, making a wide détour round Ben Nevis, and continuing westward to Mallaig along low valleys.

Oban, the chief tourist centre of the western Highlands, is reached by a branch of the L.M.S. running nearly due west from Perth up the valley of the Earn, and then of the upper Tay to its head, and through very mountainous country past Loch Awe to Oban. A short line from Oban runs up the side of Loch Linnhe to Ballachulish, where there are aluminium works using hydro-electric power for the smelting of the ore.

THE ISLANDS

162. The Scottish islands, apart from those in the Firth of Clyde (Art. 151), may be divided into three groups: the Inner Hebrides, the Outer Hebrides, and the Orkney and Shetland Isles.

(1) The Inner Hebrides contain the large islands of Skye, Mull, Jura, Islay, and many smaller ones. They are mountainous and partly volcanic in origin, and many are extremely picturesque. Both Mull and Skye have mountains rising to over 3,000 feet (*Ben More*, in Mull, 3,250 feet). The inhabitants of the Hebrides are chiefly fishermen and shepherds.

The small island of Staffa, to the west of Mull, is visited by tourists on account of the scenery of Fingal's Cave (Art. 76). The island of Iona, a few miles further south, is of great historical importance, as it was the site of a great monastery of Irish monks from which, in the seventh century, Christianity spread through southern Scotland and northern England. The ruins of St. Columba's cathedral are still in existence.

(2) The Outer Hebrides are much lower than the inner islands and the mainland, from which they are separated by the deep, wide channel called the Minch. The largest island is called Lewis in the north and Harris in the south. There is a small domestic woollen industry, the manufacture of "Harris" tweeds. The only towns of the Hebrides are Portree in Skye and Stornoway in Lewis, both fishing ports and tourist centres.

(3) The Orkney Isles are separated from the mainland by the rough waters of Pentland Firth. About fifty miles further north are the Shetland Isles, famous for a breed of small hardy ponies, and for wool. In both groups the chief occupations are fishing and weaving. The towns are Kirkwall and Stromness in Orkney, and Lerwick in Shetland. The natural harbour of Scapa Flow in the Orkneys was the chief base of the British fleet during the war of 1914-18.

QUESTIONS ON CHAPTER VIII

1. Name the rivers and lakes shown in Fig. 38.
2. Mention the natural divisions and boundaries of the Lowland Plain of Scotland, describe its surface features, and give the positions and industries of three of its most important towns.
3. Name two important ports on the east coast of Scotland, and show how the importance of each depends on its geographical position.
4. Give a brief geographical description of Scotland, south of the Grampian Hills. Name the chief productions, and indicate the position and importance of five of its principal towns.
5. On a map of Scotland mark the Ochill, Pentland, and Sidlaw Hills; Ben Lomond, Ben Nevis, Goat Fell; Inverness, Perth, Fort William, Stranraer. Sketch the outlines of the Clyde basin. Name three of the large lakes and four sounds or channels.
6. Describe Strathmore, Glenmore, the Fife peninsula.
7. Explain fully why north-west Scotland is more thinly populated than the central lowlands of Scotland.
8. Describe the basin of the Tay, pointing out the course of the main stream, the chief tributaries, and the nature of the country through which it flows.

CHAPTER IX

IRELAND

GENERAL

163. Ireland was held by the English by right of conquest for a long time, but was frequently in a state of insurrection. The country had its own Parliament till 1801, but was then united to Great Britain. In 1922, however, this union was dissolved, and Ireland was divided into two separate states:

(1) Northern Ireland, capital Belfast, contains six of the nine counties which formed the old province of Ulster (viz. Antrim, Armagh, Down, Fermanagh, Londonderry, and Tyrone). This is roughly Protestant Ireland, the rest of the country being mainly Roman Catholic. Northern Ireland, though it has its own Parliament and Government, is still part of the United Kingdom, and sends representatives to the Imperial Parliament at Westminster.

(2) Eire contains all the rest of Ireland. By a Constitution adopted in 1937, Eire claims to be a sovereign independent State, and she remained neutral during the War of 1939-45. Eire claims the whole of Ireland as her territory. The names of the old provinces of Ireland, Ulster, Leinster, Connaught, and Munster, are convenient geographical expressions, but now have no political meaning.

The population of Ireland increased up to about 1846, when a disastrous failure of the potato crop caused a famine and great loss of life. Since then the population has steadily decreased, owing chiefly to emigration to America, and is now little more than half what it was in 1846. Political discontent, the natural poverty of the country, and the absence of manufactures have produced the unparalleled stream of emigration from Ireland (even in England many rural areas have considerably decreased in population in the same period).

Only two counties in Ireland—Dublin and Antrim—have increased in population in the last century, while in England every county has shown an increase.

The Irish of the west and south are a Celtic race. In Dublin and a small area round it, the "English Pale," many of the people are of English descent, as this part of Ireland was held by the English kings long before the island as a whole was conquered. In Ulster a large proportion of the people are English or Scotch in origin, owing to the "plantation" (colonisation) of Ulster by the English government in the seventeenth century, when the original inhabitants were dispossessed in favour of Scotch and English settlers; the name *Londonderry* indicates the origin of many of these.

Ireland is rich in beautiful scenery, and derives a good deal of benefit from the "tourist industry." The chief places visited are the Lakes of Killarney, the Wicklow and Mourne Mountains (Bray and Newry), Giant's Causeway, Loughs Erne, parts of the Shannon valley, and the Donegal Highlands.

ULSTER

164. Ulster (Fig. 42) contains the nine northern counties of Ireland, but six of these, in the east, are politically separate from the rest of Ireland, forming the state of "Northern Ireland" (Art. 163). Ulster has four distinct areas of upland: (1) the lava or basalt plateau of Antrim, ending in Giant's Causeway on the north, (2) the Sperrin mountains of Londonderry, (3) the Donegal Highlands, (4) the Mourne mountains in County Down, rising within about two miles of the sea to 2,800 feet.

The Mourne Mountains consist of granite, which is largely quarried near Newry. The Antrim Plateau contains ores of iron and aluminium, which are mined chiefly at Glenarm and exported to Scotland for smelting.

The Sperrin Mountains and the Donegal Highlands are similar in build and scenery to the Scottish Highlands, which they also resemble in their wet climate, poor stony soil, and scanty, poverty-stricken population.

Between the Antrim plateau and the Sperrin Mountains is a wide flat valley, through which flows the Bann, the largest river in Ulster. The Bann rises in the Mourne Mountains, and about midway in its course traverses Lough Neagh (150 square miles). The river has near its mouth the small port and linen-manufacturing town of Coleraine. A few miles to the east is Portrush, the station for Giant's

Causeway (Art. 76). The basin of the Bann contains some of the best agricultural land in Ireland. The chief crops are oats, flax, and potatoes.

165. The production of flax in Ulster has given rise to the chief Irish industry, linen-weaving. The great centre of this industry is Belfast, at the head of Belfast Lough and at the mouth of the small river Lagan, which, like the Bann, rises in the Mourne Mountains. The flax grown in Ulster is

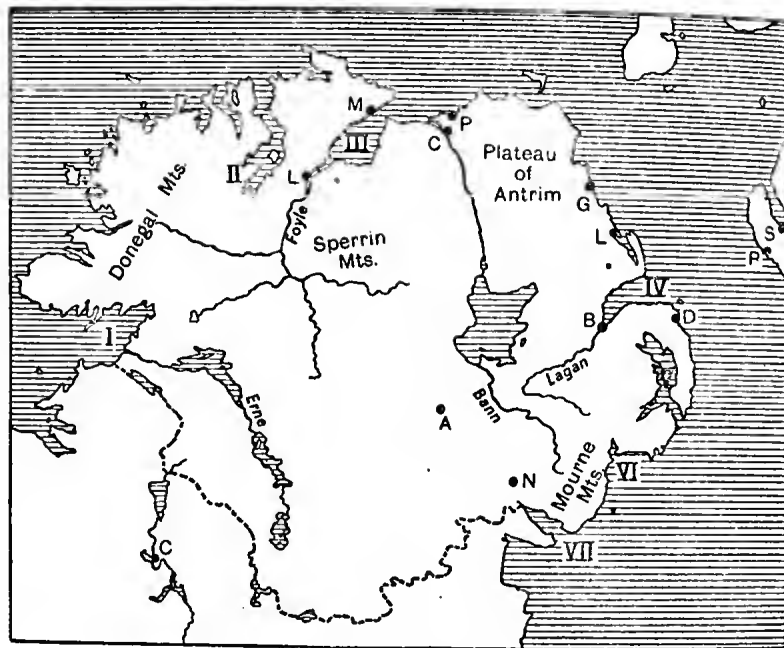


Fig. 42. ULSTER.

not nearly sufficient for the mills of Belfast, which imports large quantities, chiefly from Belgium. Belfast has also become an important ship-building town. It is in the remarkable position of having to import almost all its raw materials—flax, coal, and iron. It gets the two last chiefly from Ayrshire.

Belfast is connected with several English ports, especially Heysham, Fleetwood, and Liverpool, by regular steamers, but its passenger traffic with Scotland is mainly carried on from Larne to Stranraer.



Will F. Taylor.

HOW RESIN IS COLLECTED IN THE PINE FORESTS OF THE LANDES, FRANCE.

This forest grows in what was a sandy wilderness.

The small town of Armagh, about ten miles south of Lough Neagh, is the ecclesiastical capital of Ireland.

Besides Belfast Lough, the east coast of Ulster contains the shallow, sandy inlets of Strangford Lough, Dundrum Bay, and Carlingford Lough, the outlet of the river Newry.

166. Between the Sperrin Mountains and Donegal is the valley of the river Foyle, ending in a long wide estuary, Lough Foyle. Near the head of this lough is Londonderry, the second town in Ulster. It manufactures linen, and also exports animals and agricultural produce to England. Moville, near the entrance to Lough Foyle, is a port of call for Canadian mail steamers, corresponding to Cobh (Queenstown) (Art. 174) in the south of Ireland.

The south-west of Ulster is the basin of the Erne, a river which is little more than a string of island-studded lakes. Enniskillen, a military station, is beautifully situated between Upper and Lower Lough Erne. The river Erne is rich in salmon.

The Ulster Canal connects Belfast with the Upper Shannon at Carrick, and links up the river Lagan, Lough Neagh, and Upper Lough Erne.

LEINSTER

167. Leinster occupies the east of Ireland from Carlingford Lough to Waterford Harbour, its western boundary being the middle part of the Shannon and the eastern borders of Leitrim and Tipperary.

The northern part of Leinster is almost entirely lowland, and consists chiefly of the basins of the Boyne, Liffey, and Brosna (the chief left-bank tributary of the Shannon).

English plains consist chiefly of clay, sand, and gravel, and are very fertile. The Irish plain is a limestone plain, with only a thin soil, producing little but pasture grass. Hence Ireland is much more a pastoral than an agricultural country, and even its pasture is so poor that the cattle are commonly sent to England, or to the richer soils of Ulster, to be fattened for market.

The dissolving of limestone by rain-water and rivers has produced the very numerous lakes of the Irish plain, and the gradual filling up of old lakes with bog moss has formed the

bogs for which the country is famous. The Bog of Allen, in King's County, is the largest. More than one-fifth of the area of King's County consists of bog and marsh. Peat, which is compressed dead vegetable matter, is dug out of the bogs and largely used as fuel. It makes up to some extent for the scarcity of coal in Ireland.

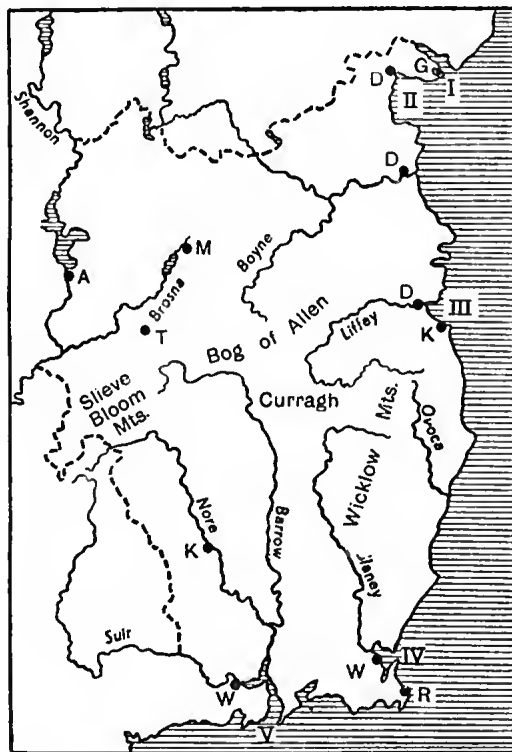


Fig. 43. LEINSTER.

168. The south of Leinster is almost everywhere hilly and in some parts mountainous. The *Wicklow Mountains*, in which rise the rivers Liffey, Ovoca, and Slaney, are the largest area of continuous high land in Ireland. They rise in Lugganacullagh to over 3,000 feet, and closely resemble the Welsh mountains. Granite is quarried, and a small amount of copper ore is mined. Farther west are the lower and smaller Slieve Bloom mountains, in which rises the Barrow, which, after receiving a long tributary, the Nore, is joined at its mouth by the Suir, the two rivers forming the long inlet of *Waterford Harbour*.

The south of Leinster is drier and warmer in summer than the rest of Ireland, and hence is more fit for agriculture. Barley is grown largely here for the breweries and distilleries of Dublin.

169. Dublin, from its central position on the east coast, at the head of a fine bay, and directly opposite Holyhead, 61 miles away, is marked out by nature as the capital of Ireland. It is the seat of government of Eire,

and the chief railway and canal centre in Ireland; it also possesses large breweries and distilleries, and manufactures poplins. It exports great numbers of cattle to England. Mails are landed, not at Dublin itself, but at the small port of Dun Laoghaire (Kingstown), on the south side of Dublin Bay.

The chief military camp of Ireland, called the Curragh, is about 30 miles inland from Dublin, near Kildare.

In the north of Leinster are the three small ports of Drogheda, on the river Boyne, Dundalk, at the head of Dundalk Bay, and Greenore, at the entrance of Carlingford Lough. The last is connected by steamer with Holyhead. In the south of Leinster the new port of Rosslare has taken the place of the old port of Wexford, rendered useless by the silting up of Wexford Harbour. Fast steamers connect Rosslare with Fishguard in South Wales, 55 miles away, and for the south of Ireland this route now supersedes the Holyhead-Dublin route.

The only important coal-field in Ireland is in the basin of the Nore, around Kilkenny, the largest inland town in Ireland. The total production of coal in Ireland is less than one-thousandth of the production in England.

Two canals cross the Central Plain of Ireland, connecting Dublin with the Shannon. The Royal Canal runs north-west through Mullingar and Longford, and the Grand Canal nearly due west through Tullamore and down the Brosna valley. The latter canal is continued in Connaught to Ballinasloe on the Suck, and has also a southward branch connecting it with the upper Barrow. Thus Ireland is well provided with inland waterways.

The inland towns of the Central Plain (including those in Connaught) are small market towns trading in cattle and dairy produce.

CONNAUGHT

170. The province of Connaught contains the counties of Leitrim, Sligo, Roscommon, Mayo, and Galway. It is the smallest of the four provinces both in area and population, and the only one that contains no large town.

The *Shannon* (250 miles), the longest river in the British Isles, though it touches all four provinces, is mainly in or borders upon Connaught, as far as Lough Derg, the lower part of the river being in Munster.

The Shannon rises in the north-west of County Cavan, and traverses the whole width of the Central Plain from north to south. It expands into numerous lakes, of which the largest are Loughs Allen, Ree, and Derg.

The two chief tributaries, the Brosna on the left and the Suck on the right, join the main river between Loughs Ree and Derg. Ballinasloe, on the Suck, is famous for its cattle

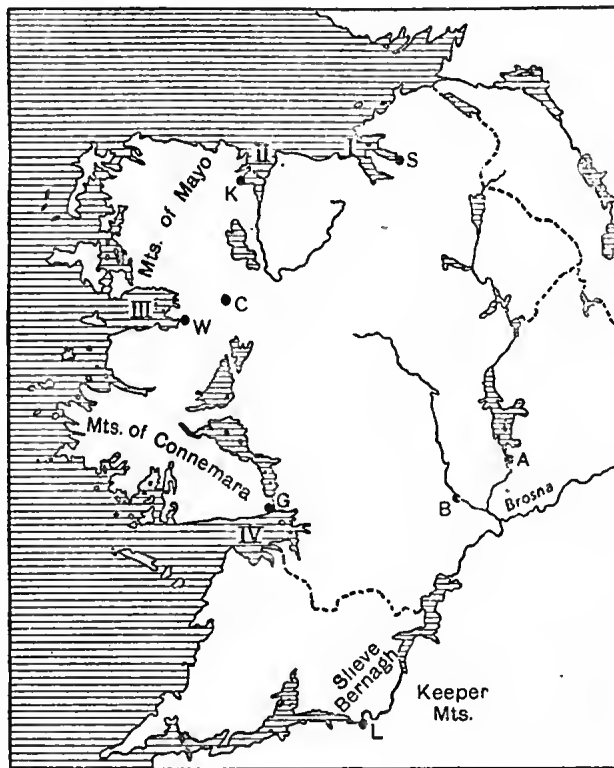


Fig. 44. CONNAUGHT.

fairs, which are the largest in Ireland. Athlone, at the south of Lough Ree, is a military station, and manufactures woollen goods.

Between Killaloe, at the southern end of Lough Derg, and Limerick, at the head of the estuary, the Shannon is hemmed in by Slieve Bernagh on the right and the Silvermine and Keeper mountains on the left, and in this narrow portion of the valley the Doonass Rapids form the only obstacle to

navigation on the whole river as far as Lough Allen. The rapids have been avoided by a short canal. The rapid fall of the Shannon in this part of its course is used to work a large power station, capable of supplying the whole Free State with electric light and power.

Below Limerick the river expands into an estuary about 60 miles long, with numerous islands.

171. In the west of Connaught, on the edge of the Central Plain, are three large lakes, Loughs Mask and Corrib, connected by an underground passage, and draining southward into Galway Bay, and Lough Conn, draining northward by the river Moy into Killala Bay.

To the west of Loughs Mask and Corrib is a wild and picturesque region of mountains and lakes called Connemara, from which marble is exported. Farther north are the mountains of Mayo, on both sides of Clew Bay, on which is the small town of Westport. The Nephon Beg mountains in Mayo rise to 2,600 feet.

The whole coast of Connaught is very irregular, and fringed with many islands. The largest of these is Achill Island, which contains the highest cliffs in the British Isles, rising almost sheer from the sea to a height of nearly 2,000 feet.

Fishing is the principal occupation in this remote region of western Connaught. The chief fishing ports are Galway and Sligo. The inland towns are little more than villages; the chief of them is Castlebar.

Galway, the largest town in Connaught, was formerly of more relative importance than it is to-day. It had a considerable trade with Spain, and part of the town is still called Spanish Town. It has been urged that Galway ought to be a port for rapid passenger traffic with America, and its position directly opposite Dublin appears very advantageous; but the cost of making it into a first-class port for large ships is prohibitive; and it would, of course, involve a further voyage from Kingstown to England.

MUNSTER

172. Munster includes the six counties between Galway Bay and Waterford Harbour. Though it is largely mountainous, it has also much fertile land, and contains three of

the six largest towns in Ireland (Cork, Limerick, and Waterford).

The chief mountains are the Mountains of Kerry, in the south-west, containing the highest mountains in Ireland, Macgillicuddy's Reeks, in which Carntual rises to 3,400 feet. These mountains overlook the beautiful lakes of Killarney, which are much visited by tourists.

In the south of Tipperary are the Galtee and Knockmeal-down mountains, and in the north of the same county the Silvermine and Keeper mountains.

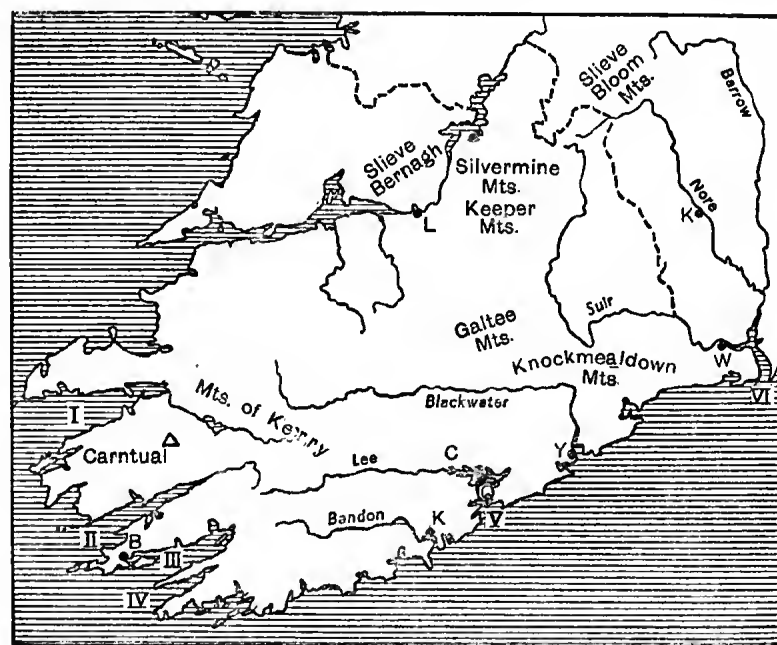


Fig. 45. MUNSTER.

173. In all the south-west of Ireland the general direction of the ranges is from east to west, and there is a remarkable series of parallel ridges separated by valleys, in which rivers flow east or west.

The westward flowing rivers are quite short, and their lower valleys have been drowned by the sea, forming the long inlets of Dingle Bay, Kenmare River, Bantry Bay, and Dunmanus Bay. Berehaven, on Bantry Bay, sheltered by Bear Island, has been made into a naval station for the British

Atlantic Fleet. Valentia Island, south of Dingle Bay, is the place where the Atlantic submarine telegraph cables leave the British Isles. It also possesses slate quarries. This part of Ireland has the mildest and most equable climate of any part of the British Isles.

The eastward flowing rivers of Munster follow remarkably parallel courses. Each flows at first nearly due east through a long straight valley, between mountain ridges, and then makes a more or less abrupt turn to the south, cutting through the southward ridge in a narrow gorge. These rivers are the Bandon, with the port of Kinsale at its mouth, the Lee, with Cork and Queenstown, the Blackwater, with Youghal, and the lower Suir, with Waterford. The upper Suir flows through a long north and south valley, but is turned eastward by the Knockmeal-down mountains, and the lower course of the river is parallel to the other rivers mentioned.

174. Of the ports above mentioned Cork (with Queenstown) and Waterford are much the most important.

Cork, the third town in Ireland, is at the head of a fine sheltered harbour, and has a large trade, chiefly with Bristol, in cattle, bacon, and butter. Cobh (Queenstown), on an island in the harbour, is a port at which American steamers call to pick up or set down mails and passengers, who can save time by taking train to Kingstown or Rosslare, and then crossing to Holyhead or Fishguard.

Waterford, the outlet for both the Barrow and Suir valleys, is a smaller port with much the same kind of trade as Cork.

The only other considerable town of Munster is Limerick, at the head of the Shannon estuary. The flat country to the south and west of the town, called the "Golden Vale," is said to be the best grazing-land in Ireland.

Bacon-curing and tanning are important industries in Limerick, which exports bacon, leather and cattle.

RAILWAYS

175. Four main lines of railway run from Dublin.

The *Great Northern* line connects Dublin with Belfast, via Dundalk and Newry.

The *Midland Great Western* line runs due west through Athlone to Galway, with branches to Westport, Killala, and Sligo.

The *Great Southern and Western* line connects Dublin and Cork, with branches from Tipperary to Waterford, from Mallow to Killarney and Valentia, and through Limerick to Sligo.

The *Dublin and South-Eastern* Railway connects Dublin with Waterford, via Wicklow.

The *Midland* line from Belfast through Coleraine to Londonderry is owned by, and is a continuation of, the Midland railway of England, connection by steamer being made from Heysham to Belfast.

QUESTIONS ON CHAPTER IX

1. Give a short description of the province of Leinster, and name and give the position of two of its principal towns, stating in what their importance consists.

2. Give an account of the vegetable and mineral productions of Ireland.

3. Describe the physical features and coast-line of the province of Munster, giving the names and positions of two ports and two inland towns belonging to the province.

4. Draw a sketch-map of Ulster; write in their proper places the names of the adjoining counties, and trace the outline of Fermanagh; insert two lakes, and name four deep inlets from the sea.

5. Account for the sparse population of Ireland; describe the surface features of the interior of that country; state in which part population is thickest; name two chief towns in that part; give reasons for the greater density there.

6. Draw a sketch-map of the east coast of Ireland. Name the counties, river-mouths, inlets, and towns.

7. State what you know of Dun Laoghaire, Cobh, the Curragh, Achill Island, Giant's Causeway, Valentia Island.

8. What English ports are most closely connected with Ireland? What are the chief kinds of merchandise brought to these ports from Ireland?

9. In Figs. 42-5 name all the towns shown, the chief lakes, and the inlets which are numbered on the maps.

10. On the given map (of Ireland) insert the Slieve Bloom and Wicklow Mountains, the Bog of Allen, and the river Blackwater. Mark two of the chief ports of call for passenger boats. Name three of the larger lakes, and also two of the inlets on the south-west coast. Mark Athlone, Dublin, Galway, Waterford, Limerick, and the inland boundary of Munster.

CHAPTER X

EUROPE

GENERAL

176. Europe is a peninsula of Asia, forming part of the great land mass called Eurasia, which contains about two-fifths of the whole land area of the globe and about four-fifths of the whole population.

The area of Europe ($3\frac{3}{4}$ million square miles) is about thirty times that of the British Isles, but only about one-fifth of the area of Asia. The boundaries of Europe towards Asia are rather vague and indefinite. The natural boundary on the east would be the Ural Mountains and the Ural River, but these do not coincide with political boundaries. On the south-east the two continents are partly separated by the waters of the Black Sea and the Caspian, and joined by the broad isthmus of Caucasia, across which is a lofty mountain barrier, the Caucasus Mountains, rising in Mount Elbrus to 18,500 feet.

Geographers consider the natural boundary of Europe here to be formed by a series of low valleys north of the mountains, connecting the Caspian Sea with the Sea of Azov. The greater part of this boundary is formed by the river Manych. Thus the whole of Caucasia is considered to be Asiatic.

Europe extends on the north to North Cape, in latitude 72° N., but only a small area of land is within the Arctic Circle. The southernmost point is Cape Tarifa in Spain, about latitude 36° N. Cape Matapan, in Greece, is almost in the same latitude. Thus almost the whole of Europe lies within the north temperate zone. The westernmost point of the mainland is Cape Roca, in Portugal, but Ireland extends nearly two degrees farther west.

COASTS

177. The coast line of Europe is considerably longer in proportion to its area than that of any other continent. This is due not so much to minor indentations of the coast as to large inland seas.

In the north-west are the Irish Sea, English Channel, North Sea, and Baltic Sea, all less than 600 feet deep. The North Sea is the chief fishing ground of Europe. These shallow northern seas are mostly surrounded by low plains, and their shores are generally low and shelving, and often bordered by sand-dunes. On the south shore of the Baltic there are numerous large lagoons ("haffs") lying behind sand-bars. A considerable part of Holland (the Netherlands, or "lower lands") is slightly below sea-level, and the sea is kept out by artificial ramparts called dykes.

The west coast of Scandinavia is like the west coast of Scotland on a much magnified scale. The coast is high and rocky, with many fjords, some penetrating as much as 100 miles inland. The chief fjords are the Trondhjem, Sogne, Hardanger, Stavanger, and Oslo fjords. Off the coast are thousands of small rocky islands, of which the largest are the Lofoden Islands. Near the south of these is a celebrated tidal race, the Mälstrom, generally, but wrongly, called a whirlpool.

The entrance to the Baltic is nearly blocked by a group of low, flat islands, mostly belonging to Denmark, of which Zealand is the largest.

178. Strongly contrasted with the cold, shallow northern seas of Europe is the warm, deep basin of the Mediterranean, separating Europe from Africa. It is divided into an eastern and a western basin, connected by the narrow strait of Messina and the wide but shallow strait of Tunis. The western basin is almost completely encircled by mountains, and contains the large and mountainous islands of Corsica (French), Sardinia (Italian) and the Balearic Isles (Spanish). Just north of Sicily is the small volcanic group of the Lipari Isles.

The eastern basin of the Mediterranean has two large northward gulfs, the Adriatic Sea and the Aegean Sea, the latter containing the numerous islands of the Archipelago between Greece and Asia Minor. The eastern Mediterranean also contains the large islands of Crete and Cyprus.

The European part of the Mediterranean coast is mostly very rocky and picturesque, with many fine headlands, gulfs, and bays. In the north-west of Europe, where tides are very powerful, most rivers form large estuaries. In the

Mediterranean, on the other hand, rivers tend to form deltas, as tides are almost non-existent.

As river channels in deltas are always tending to silt up, the curious result occurs that, whereas in northern Europe almost all the great ports are on large rivers, in the Mediterranean none of the important ports are on rivers. Thus Barcelona, Marseilles, Venice, Salonika are all at some distance from the mouths of the rivers with the basins of which they are naturally connected.

The Mediterranean is connected, through the narrow straits of the Dardanelles (one to four miles wide) and the Bosphorus (one-third to two miles wide), and the small Sea of Marmora, with the deep basin of the Black Sea, which receives numerous large rivers, and is much less salty than the Mediterranean. Its European coast is generally low. On the north of the Black Sea the strait of Kertch, between the Crimea and the Caucasus, leads into the small, shallow Sea of Azov. At the other end of the Caucasus is the entirely land-locked Caspian Sea, the surface of which is eighty-five feet below sea-level. It receives the longest European river, the Volga.

LAND-RELIEF

179. Europe can be broadly divided into three parts—(1) the highlands of the north-west (Scandinavia), (2) the great European Plain, (3) the highlands of the centre and south.

I. THE NORTH-WESTERN HIGHLANDS

180. The Scandinavian Peninsula, containing the two kingdoms of Norway and Sweden, is a long high plateau, with a very steep slope to the Atlantic, and a much longer and more gradual slope to the Baltic. The plateau is widest and highest in the south, rising to about 8,000 feet in the Dovre Feld and Jötun Feld near the head of the Sogne Fjord. There is no regular range, and the plateau much resembles the Scottish Highlands, but is on a larger scale, and rises in many places beyond the snow-line.

To the south-east of the plateau is a wide depression in which lie three large lakes, Vener, Vetter, and Mälar. To the south of these is a low plateau between the Cattegat and the Baltic.

II. THE EUROPEAN PLAIN

181. A great plain stretches from the Bay of Biscay through northern France, the Low Countries, northern Germany, Poland, and Russia. The plain is narrow in the west, but widens out in Russia to include almost the whole country. The plain is by no means uniform, though it is almost everywhere below 600 feet in height. The narrower western part of it is diversified by the highlands of Brittany (granite) and of Normandy (limestone), and by the Baltic Heights (old glacial moraines) along the south shore of the Baltic, mainly between the Oder and the Dwina.

Further east the Russian plains swell up in the middle into a low plateau, from 600 to 1000 feet high, which is the chief watershed of eastern Europe. The northern part of this plateau is called the Valdai Hills.

III. THE CENTRAL AND SOUTHERN HIGHLANDS

182. These consist of (a) the central highlands, (b) the mountains of the three great southern peninsulas—the Iberian and Balkan Peninsulas and Italy.

(a) The Central Highlands

183. The central highlands contain (i) an inner semicircle of the Alps, separated by the Rhône (below Lake Geneva), Rhine, and Danube valleys from (ii) an outer semicircle of lower ranges and plateaus extending from the south of France through central Germany to the south of Hungary (Fig. 47).

(i) *The Inner Division.*—The Alps are a very complicated mountain system which covers an area about equal to the British Isles. From near the head of the Gulf of Genoa they extend first west, then north and then east, filling all the southern half of Switzerland, the north of Italy, and the west of Austria. The Western Alps are high, but comparatively narrow, the Eastern Alps lower, but broader. The most important summits in the west are Mont Blanc (15,800 feet), the Matterhorn, and Monte Rosa in the Pennine Alps, the Jungfrau, Finsteraarhorn, and Wetterhorn in the Bernese Alps. These are mostly from 14,000 to 15,000 feet high.

These and many other mountains rise far above the snow-line, which is about 9,000 feet high in Switzerland, and the upper parts of many of the valleys are occupied by *glaciers*, from which rivers flow.

The Alps descend very steeply on the south to the Plain of Lombardy, and much more gradually to the north to the valleys of the Rhine and the Danube.

The term Alps or Alpen is really a local Swiss name for high pastures, but now means the mountains as a whole.

184. A great mountain system such as the Alps is of course a great barrier to travel and communications; but there are a number of passes, from 4,000 to about 8,000 feet in height, by which it is fairly easy to cross the ranges from one river-basin to another (Fig. 46). Thus in the Western Alps the Mont Cenis Pass (west of Turin) and the Little and Great St. Bernard Passes (one on each side of Mont Blanc) lead from the basin of the Po to that of the Rhône. In the Central Alps the Simplon Pass also connects northern Italy with the Rhône valley, and the St. Gothard Pass connects the Ticino with the Reuss, a tributary of the Rhine. In the Tyrol the Brenner Pass leads from the valley of the Etsch or Adige to that of the Inn, and so to the Danube.

In modern times engineers have driven long railway tunnels through several parts of the Alps, and so have diminished the importance of the old roads across the passes. The chief tunnels are under or near some of the passes already mentioned, *e.g.* the Mont Cenis, Simplon (12 miles long), and St. Gothard tunnels.

North of the Simplon the new Lötschberg Tunnel has been bored through the Bernese Alps, considerably shortening the northward route, which formerly had to go a long way down the Rhône valley. The Brenner is the lowest of the important passes (4,600 feet), and the railway crosses it without any long tunnels.

(ii) *The Outer Division.*—The outer semicircle of highlands (Fig. 47)* surrounding the Alps has one end in southern

* In studying Fig. 47 it should be remembered that, though the mountains are shown merely by lines, they really cover most of the area shown in the map. In Central Europe it is not the mountains but the valleys that are narrow.

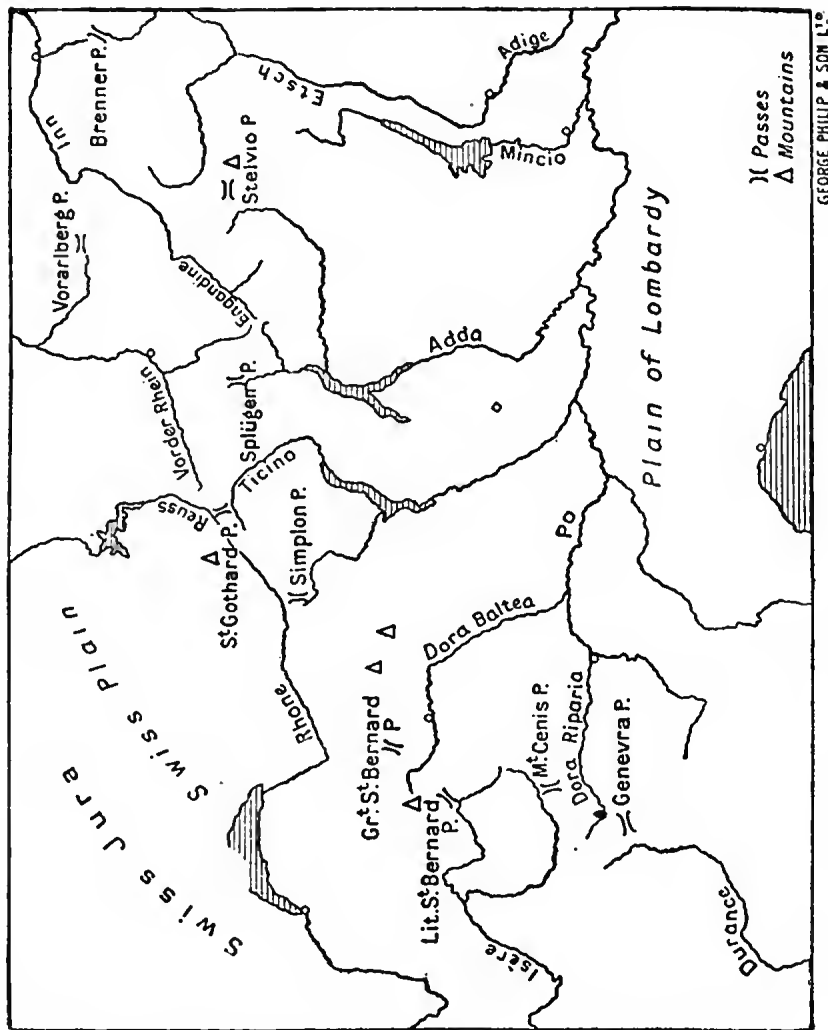


Fig. 46. THE PASSES OF THE ALPS.

France, in the Cevennes and Auvergne mountains, together forming the Central Plateau of France.

185. The Auvergne mountains contain many recently extinct volcanoes. The Central Plateau is separated from the Alps and the Swiss Jura by the long, narrow valley of the Rhône and the Saône, one of the most important northward routes from the Mediterranean. The valleys of the Central Plateau (Loire, Allier, Lot, Tarn) are deep gorges, in some places so narrow as to be almost cañons.

North of the Jura, but separated from it by a low gap called the Burgundy Gate, an easy route from the Saône to the Rhine (A in Fig. 47), lie the Vosges mountains, and parallel with these, but on the east side of the Rhine, is the Schwarzwald or Black Forest. This middle part of the Rhine basin is a rift-valley. Farther north the Rhine and Moselle have cut narrow valleys through the Rhine Highlands (Taunus and Eifel), which extend westward to the Ardennes in southern Belgium.

186. Southern Germany, outside the Rhine valley, consists almost wholly of highland. The Bavarian Plateau extends from Switzerland to the upper Danube, and north of this river is the German Jura, a continuation of the Swiss Jura. Farther north are the Thuringian Forest and the isolated range of the Harz mountains, the most northern of the Central Highlands. The "Bohemian Diamond" is a basin almost completely encircled by what were formerly frontier mountains. For recent changes of frontier here see Art. 229.

The Elbe cuts through the northern mountain border of Bohemia in a narrow passage, thus giving Czecho-Slovakia an outlet to Germany. Its capital, Prague, is about as far from the sea as any large town in Europe, outside Russia, but by way of the Moldau and Elbe Prague has navigable water to Hamburg.

187. A low gap called the Moravian Gate (D in Fig. 47) (an easy passage joining Vienna to the northern plain) separates the Sudetes from the Carpathian mountains. From the Danube a little below Vienna this range sweeps in a great semicircle, enclosing the Hungarian Plain, back to the Danube again where that river passes through the narrow gorge called the Iron Gate. The Carpathians are highest and most rugged in the north (the High Tatra, nearly 9,000 feet). The southern part of the range, overlooking the Wallachian Plain, is called the Transylvanian Alps.

The narrow gap at Bratislava between the Little Carpathians and the Eastern Alps, is called the Hungarian Gate (C in Fig. 47).

The only large areas of lowland in southern Europe (outside Russia) are the Hungarian Plain between the Carpathians and

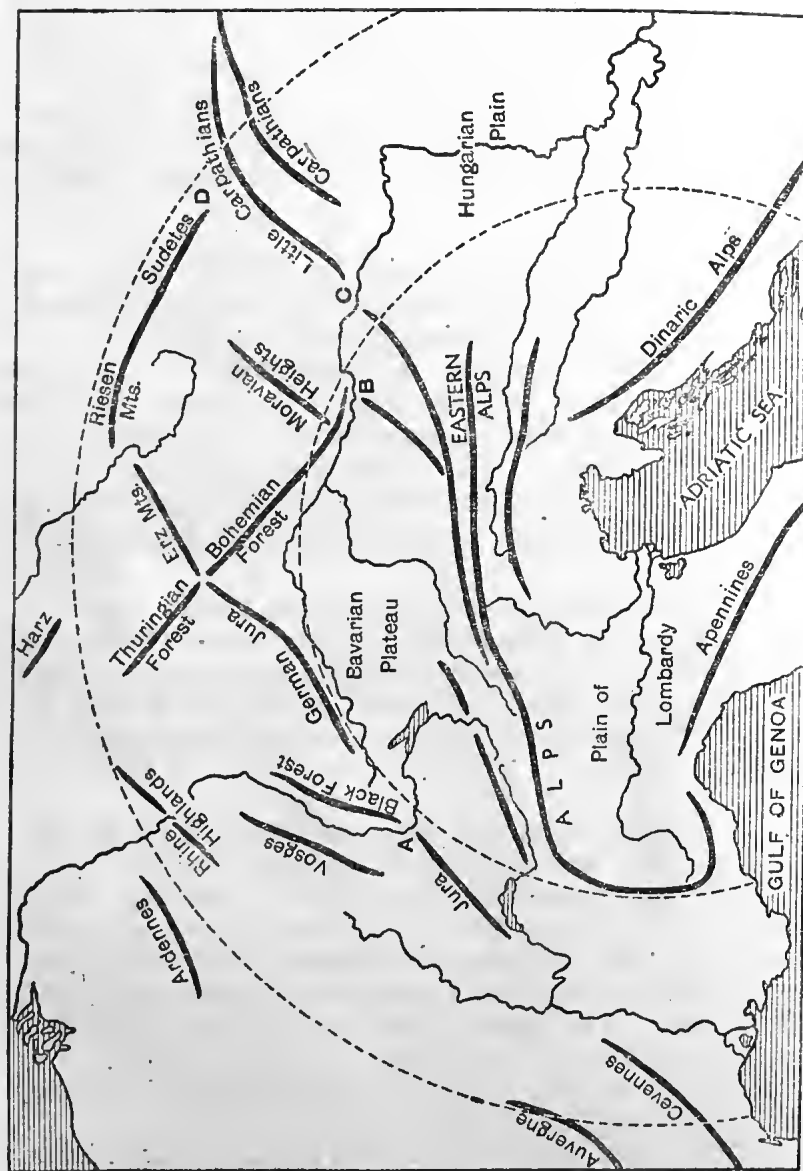


Fig. 47. MOUNTAIN LINES OF CENTRAL EUROPE.

A.—Burgundy Gate. B.—Austrian Gate. C.—Hungarian Gate. D.—Moravian Gate.



Malayan Information Agency.

RUBBER PLANTATION, MALAYA.

The trees are cut for rubber tapping. Notice the small vessel for collecting the rubber on the tree in the foreground.

the Alps, the Wallachian Plain between the Transylvanian Alps and the Balkan Mountains, and the Plain of Lombardy between the Alps and the Apennines.

(b) The Southern Peninsulas

188. The three southern peninsulas of Europe are all mountainous.

The Iberian Peninsula is cut off from France by one of the most distinct natural frontiers in existence—the Pyrenees Mountains (Maladetta, 11,000 feet). As a barrier to communications the Pyrenees surpass the Alps. Until 1928 no railways and very few roads crossed the range, the two railways from France to Spain creeping round the ends of the range close to the sea. Since 1928 two railways have been built across the range, one having a tunnel (Somport) nearly five miles long. These lines connect Toulouse with Barcelona, and Pau with Saragossa. While nearly all European countries have adopted the standard English gauge (4 ft. 8½ in.), Spain and Portugal have kept a wider gauge, so that it is necessary to change trains at the frontier.

The Cantabrian Mountains are a western lower continuation of the Pyrenees. The higher valleys of the Pyrenees, unlike those of the Alps, in many cases do not rise gradually to a neck or pass on the crest of the ridge, but end abruptly in a *cirque*, the head of the valley being closed by a roughly semicircular wall of cliff.

In the extreme south of Spain the Sierra Nevada (= snow mountains) rise almost straight from the sea to beyond the snow-line. Their highest point, Mulahacen (11,600 feet), is the highest mountain in Europe outside the Alps.

The remainder of the peninsula consists mainly of a plateau called the Meseta, from 2,000 to 5,000 feet high, separated from the northern ranges by the Ebro valley (the plain of Aragon), and from the southern ranges by the valley of the Guadalquivir (the Plain of Andalusia). These, with the southern half of Portugal, are the only considerable lowlands in the peninsula. The steep southern edge of the Meseta is called the Sierra Morena.

The Meseta is crossed by numerous mountain ranges, of which the most important are the mountains of Castile and of Toledo, respectively north and south of the upper Tagus.

189. Italy is also mountainous, but the average elevation is much less than that of Spain, as there are no large tablelands. In the north is the low, flat Plain of Lombardy, the basin of the river Po. The whole length of peninsular Italy is occupied by the limestone ranges of the Apennines. From Genoa the mountains traverse the country diagonally to the east coast near Ancona, and then come back to the west coast in the south. Thus in the north and centre of the peninsula the chief lowlands, the plains of the Arno and the Tiber, are on the west side, while in the south the east side is lowland. The highest point of the Apennines is Monte Corno (9,600 feet), on the west of the central part of the range.

There are numerous extinct volcanoes (small lakes now filling their craters) west of the central Apennines, and farther south the still active cone of Vesuvius rises 4,000 feet near Naples. A line of volcanic activity runs southward from Vesuvius through the Lipari Islands, where Stromboli is almost continually in eruption, to Mount Etna (11,000 feet) in Sicily, the greatest active volcano in Europe.

190. The Balkan Peninsula, from the lower Danube and the Save to Cape Matapan at the south of Greece, is a mass of very irregular mountain blocks and ranges, with a few small lowlands on the east, round the rivers Danube, Maritsa, and Vardar, and the Plain of Thessaly, in the north of Greece.

The Balkan mountains lie parallel to the lower Danube and farther south are the Rhodope mountains (nearly 10,000 feet), between the rivers Struma and Maritza. In the west of the peninsula are the Dinaric Alps, Shar Dagh (over 10,000 feet), and the Pindus Mountains.

The south of Greece (Morea) is only connected with the mainland by the narrow Isthmus of Corinth, through which a ship-canal has been cut.

RIVERS

1. SCANDINAVIAN RIVERS

191. The chief rivers of Scandinavia are the Klar, running south into Lake Vener, which drains through the Göta river into the Cattegat; and the Glommen, which rises near the Klar, south of Trondhjem, and runs into Oslo Fjord.

Scandinavia is so mountainous that its very numerous rivers, are, with the exception of the Göta, of little or no use for navigation; but they are of growing importance on account of the water-power obtained from their waterfalls, used for saw-mills and in electrical industries.

2. RIVERS OF CENTRAL EUROPE

192. The rivers of central Europe may be divided into two important groups—(a) rivers flowing generally north-westward from the Central Highlands across the northern plain, and (b) the Rhône and Danube flowing to the south-west and south-east respectively.

(a) Rivers Flowing North-West

All the rivers of the first group are navigable by small steamers for considerable distances. They generally end in large estuaries, and have important ports at or near their mouths.

The Garonne (350 miles) is the only large river which rises in the Pyrenees. It runs past the wine-exporting town of Bordeaux into the long estuary called the Gironde, where it is joined by the Dordogne from Auvergne. The Garonne is navigable to Toulouse, from which a canal runs eastward to Cette through the Carcassonne gap between the Pyrenees and the Cevennes, thus connecting the Bay of Biscay with the Mediterranean.

The Loire (570 miles) is the largest river which is wholly French. It rises in the Cevennes, and flows north and then west past Orleans and through a wide fertile plain to Nantes. Its chief tributaries, Allier, Cher, and Vienne, all come from the Central Plateau. The upper valleys of the Loire and Allier are narrow deep gorges.

193. The Seine (480 miles) is almost wholly a lowland river. It rises near Dijon in the famous wine-producing hills of the Côte-d'Or, and flows through Paris (where several tributary valleys converge) in an extremely winding course to the English Channel. The great port of Havre is on the north side of its estuary. Its chief tributary, the Marne, flows through another famous wine district, that of Champagne. The "Paris Basin" round the middle Seine is so low

(Paris is only 85 feet above sea-level) and so well-watered that it is liable to serious floods when exceptional rainfall occurs in the upper basins of the Seine, Yonne, and Marne.

The Scheldt (250 miles) is chiefly a Belgian river, though it rises in north-east France. It is wholly a lowland river, flowing through the important textile-manufacturing district of Flanders to the great port of Antwerp. The estuary of the Scheldt belongs to Holland.

The Meuse (500 miles), called in Holland the Maas, rises near the Marne in the Plateau of Langres, and flows north through a wooded valley of the Ardennes into Belgium, crossing the great Franco-Belgian coal-field (Art. 209). The lower Maas gradually approaches the Rhine, and the rivers mingle at their mouth in a common delta. The chief tributary of the Meuse is the Sambre.

194. The Rhine (760 miles) rises a little north of the St. Gothard Pass, and flows east and then north to Lake Constance (the largest of the Alpine lakes, about 200 sq. miles). Near Schaffhausen, a few miles below the lake, there are falls and rapids. Near Basel the river turns abruptly to the north and, leaving Switzerland, flows between France and Germany.

The chief Swiss tributary of the Rhine is the Aar, which flows through Lakes Brienz and Thun, and receives tributaries from Lakes Neuchâtel, Lucerne, and Zürich.

From Basel the Rhine flows northward through a wide very fertile rift-valley between the Vosges and the Schwarzwald, receiving on the right bank its chief German tributaries, the Neckar and the Main, from opposite ends of the German Jura.

Between Mainz, at the confluence of the Main, and Bonn the river has cut a narrow picturesque gorge through the forest-clad Rhine Highlands. This is the part of the river that is chiefly visited by tourists. At Coblenz, halfway through the gorge, the Rhine receives a large tributary from France, the Moselle, which rises in the Vosges. Just above Coblenz the Lahn flows in on the right bank.

In the neighbourhood of Cologne the Rhine enters the German Plain, and flows north-west into Holland, which consists chiefly of the combined delta of the Rhine, Maas, and Scheldt.

The great seaport of the Rhine is Rotterdam, from which a ship-canal, the "new waterway," leads to the Hook of Holland, on the North Sea.

The Rhine is navigable by small steamers to Basel, and large steamers (1,500 tons) can ascend to Mannheim, at the confluence of the Neckar. From this river-port to the sea the river is a great commercial highway, and probably carries more goods than any other river in Europe.

Small canals (Fig. 48) connect the Rhine through Strasbourg (on the Ill, a few miles from the main river) with the Marne (and thus with Paris) and with the Rhône. The latter canal goes through the Burgundy Gate. A canal, recently enlarged, also joins the Main with the Upper Danube.

The canals shown in Fig. 48 are mostly much broader and deeper than English canals, and inland navigation in general, by river and canal, is immensely more important in France, Germany, and the Low Countries than it is in England, where many of our canals are almost unused, and even when used can only accommodate small barges.

195. The Weser (380 miles) is the largest river which is wholly German. It rises in the Thuringian Forest, and has the old port of Bremen at the head of its estuary. The important German naval station of Wilhelmshaven is a little west of the mouth of the river.

The Elbe flows from the Riesengebirge across the mountain-rimmed basin of Bohemia, and through a gorge in the Erzgebirge into Saxony, entering the German plain at Dresden, and reaching the head of its estuary at Hamburg, one of the greatest seaports in continental Europe. The chief tributaries are the Moldau in Bohemia and the Havel in Germany. The latter is connected by canal with Berlin, and with the Oder. The Elbe and Moldau are navigable, except in very dry seasons, as far as Prague.

From the estuary of the Elbe a great ship-canal, the Kaiser Wilhelm Canal, has been cut across the Isthmus of Schleswig-Holstein to Kiel on the Baltic. Another smaller canal connects Lübeck on the Baltic with the Elbe above Hamburg.

The Oder (580 miles) rises in the Moravian Highlands in Czecho-Slovakia, and flows through the Moravian Gate into the mining province of Silesia, and through its capital,

Breslau. The Oder is navigable almost throughout its whole length. Its port is Stettin, which is important as the port nearest to Berlin.

The Vistula (630 miles) rises in the extreme north-west of the Carpathians, flows through the middle of Poland in a wide semicircle to Thorn, and then turns abruptly to the north into the Gulf of Danzig. It is navigable up to Warsaw, the capital of Poland. At its mouth is the "free city" of Danzig, an independent state under the protection of the League of Nations.

(b) The Rhône and the Danube

196. The valley of the Rhône-Saône is the only northward route from the Mediterranean that is without serious natural obstacles. Though this valley has always been very important as a land route, the river is of little use for navigation, as the channels in the delta are too shallow, and farther up the river is too rapid.

The Rhône (490 miles) rises in a glacier near the St. Gothard, and flows west between the Bernese and Pennine Alps till it is diverted northward by the Mont Blanc group into Lake Geneva, which it is slowly filling with silt. Below this lake the river flows south and west to Lyons, where it receives the Saône from the north, and then flows southward between the Cevennes and the Alps in a narrow valley which widens into a marshy delta. A little to the east of the delta is Marseilles, the greatest seaport of the Mediterranean and the second town in France. Still further east is the great naval port of Toulon.

197. The Danube (1,700 miles), the great highway from west to east in central Europe, rises in the Schwarzwald within a few miles of the Rhine valley. It flows first north-eastward between the German Jura and the Bavarian Plateau, receiving from the latter the tributaries Lech, Isar, and Inn, all rising in Switzerland. The upper part of the Inn valley, in the Rhaetian Alps, is a famous health resort called the Engadine.

The Danube enters Austria by a narrow valley (the Austrian Gate), widening out lower down into the Austrian Plain, on which stands Vienna. Below this the valley is narrowed again at Bratislava into the Hungarian Gate, by which the

river enters the Little Hungarian Plain, which is about as large as Yorkshire. It is separated by the Bakony Forest from the Great Hungarian Plain, as large as Ireland. The river enters this at Waiten, between the Bakony Forest and the Carpathians. In the north of the plain is the important city of Budapest.

In Yugoslavia the river turns eastward again and receives three long tributaries, the Theiss (Tisza) from the Carpathians, and the Drava and Sava from the eastern Alps. The Danube then flows through the narrow gap between the Transylvanian Alps and the Balkan mountains, in a narrow rocky gorge called the Iron Gate, formerly the chief obstruction to navigation on the river. The channel here has been deepened to ten feet, however, and the river is now navigable to Regensburg (Ratisbon), its most northerly point.

Below the Iron Gate the Danube flows along the southern edge of the wide plain of Walachia, and for about 200 miles forms the boundary between Romania and Bulgaria. The north bank here is very low and marshy, while the south bank is high. The river is turned to the north by a low plateau called the Dobruja, and then turns east again, entering the Black Sea through a swampy delta with three chief mouths. The last tributaries, the Seret and Prut, flow in at the head of the delta, from the east of the Carpathians.

3. RUSSIAN RIVERS

198. The rivers of Russia flow into four seas—the Arctic, Baltic, Black Sea, and Caspian. As the country is so nearly level, the larger rivers are generally navigable, at any rate by barges, through nearly their whole length, and for the same reason they are easily connected by canals. River navigation, however, is stopped in winter by ice—for about three months on the lower Volga, and for over six months on the Northern Dvina. In the dry autumn some of the southern rivers become too shallow for navigation, for which the best time is in the spring and early summer, when the rivers are in flood.

The chief Baltic rivers of Russia are the Niemen, flowing into a large lagoon in the extreme north-east of Prussia; the Western Dvina or Duna, flowing from the Valdai Hills, near the source of the Volga, into the Gulf of Riga; and the short

but large river Neva, connecting Lake Ladoga (the largest lake in Europe) with the Gulf of Finland. Lakes Onega and Ilmen send rivers into Lake Ladoga, and thus contribute water to the Neva, which has at its mouth Leningrad.

The northern slope of Russia is drained chiefly by the Northern Dvina into the White Sea at Archangel, and by the Pechora direct into the Arctic Ocean.

199. The chief Black Sea rivers of Russia are the Dniester (700 miles) from the Carpathians, the Bug, the Dnieper (1,200 miles), the third longest river in Europe, and the Don (1,000 miles). The two last rivers rise in the central plateau, the source of the Dnieper being near those of the Volga and Western Dvina.

The Volga (2,200 miles) the longest river in Europe, rises in the Valdai Hills and flows east and then south into the Caspian Sea, having a large delta with more than sixty mouths. From near Saratov the valley is below sea-level, though of course above the level of the Caspian. The current is very slow, for in a course of about 2,000 miles there is only a fall of about 600 feet—roughly one foot in three miles. The chief tributaries of the Volga are the Oka and the Kama. The former joins the main river at Nijni-Novgorod, famous for its annual fairs. On a tributary of the Oka stands Moscow, the capital and the most central town in Russia.

4. RIVERS OF THE SOUTHERN PENINSULAS

(a) The Iberian Peninsula

200. In the Iberian Peninsula the rivers of the Meseta generally flow in deep narrow valleys. They are too rapid and shallow for navigation, and too far below the general level of the plateau to be used for irrigation.

The only large Mediterranean river of the Peninsula is the Ebro (420 miles), which rises in the Cantabrian Mountains and flows across the Plain of Aragon, between the Pyrenees and the Meseta, into a flat swampy delta.

The Atlantic rivers are all more or less parallel, the general direction being west, with a southward bend near the mouth. The chief rivers are the Douro, with Oporto at its mouth, the Tagus (510 miles), with a large estuary on which stands Lisbon, the Guadiana, forming part of the eastern frontier of

Portugal, and the Guadalquivir, which is navigable by ships of 1,000 tons to Seville, and has near its mouth the chief port of southern Spain, Cadiz.

(b) Italy

201. In Italy by far the most important river is the Po, which rises in Monte Viso in the western Alps, and flows north-east to Turin, and then nearly due east to its large delta, which is rapidly advancing into the Adriatic. The Plain of Lombardy, along which the Po flows, was once a gulf of the Adriatic, but has been filled with a deep layer of fertile alluvial soil brought down from the Alps and Apennines. The lower river has raised its bed above the level of the plain, and there are extensive swamps below Ferrara.

Along the northern edge of the plain, among the foothills of the Alps, are a number of beautiful lakes, from which rivers flow into the Po. The largest lakes are Maggiore, Como, and Garda, drained respectively by the rivers Ticino, Adda, and Mincio.

The river Adige (or Etsch) is the only other large river of the Adriatic. Its lower course is parallel and near to that of the Po. The Adige valley is important as leading up to the Brenner Pass, the easiest to cross of all the Alpine passes (Art. 184).

The importance of the Adige is illustrated by the selection of the town of Trent as a meeting place for a great Roman Catholic Church Council at the time of the Reformation.

The chief rivers of peninsular Italy are the Arno and the Tiber, which are only navigable by small boats.

(c) Balkan Peninsula

202. In the Balkan Peninsula, apart from the lower Danube and its tributaries, the only important rivers are the Maritsa and the Vardar, both flowing south-east into the Aegean sea. These rivers are chiefly important as routes. The railway from Belgrade southward, climbing up the Morava valley, branches at Nish in the South of Serbia into two lines, which cross fairly low passes into the valleys of the Maritsa and Vardar, and run to Constantinople and Salonika respectively. These lines are the only important railways in the Balkan Peninsula.

CLIMATE

203. Nearly all Europe except the extreme south lies in the belt of westerly variables (Art. 41), and therefore its climate is largely determined by winds from the Atlantic. The drift of warm surface water north-eastwards across the Atlantic makes the prevailing west winds both warm and moist, and has a very favourable effect on the climate, especially in north-west Europe.

Cultivated plants can be grown in a higher latitude in Norway than anywhere else in the world, and the ports of Norway are never blocked by ice, though in the east of Europe the mouth of the Volga, in about the same latitude as Venice, is frozen every winter.

204. Europe may be broadly divided into three climatic regions.

(i) **Western Europe** (Norway, Denmark, the Low Countries, British Isles, France, N.W. Spain) has an equable climate of mild winters and cool summers. The region as a whole is rather rainy, especially on the western slopes of mountains. Rain falls at all seasons, but there is generally a maximum in autumn.

(ii) **Central and Eastern Europe** has a smaller rainfall (chiefly in summer), but a much greater difference between summer and winter temperatures. The range between the hottest and the coldest month is 20° at Brest, 29° at Paris, 36° at Berlin, and 53° at Moscow. The rainfall decreases, and the range of temperature increases, towards the south-east. A belt round the Caspian Sea, with less than ten inches of rain a year, is the driest part of Europe, Astrakhan having only about six inches annually.

(iii) **Southern Europe** has hot dry summers and mild rather rainy winters (Art. 60). The difference between the wet and dry seasons is more strongly marked towards the south of the area. There is, for instance, a fair amount of summer rain in the Plain of Lombardy, but hardly any in Sicily. The south and west slopes of the Alps and Apennines have heavy rainfall. The driest parts of the Mediterranean area are central and south-eastern Spain and the east of the Balkan Peninsula.

205. The following table shows average monthly temperatures and rainfall for a number of towns, of which the first four are in the west, the next four in the east, and the last four in the south, of Europe. In your atlas locate carefully all the towns mentioned. Note that Milan, though in the Mediterranean area, has not got the typical Mediterranean climate, having nearly as much summer as winter rain, and a rather high range of temperature. Work out for each of these towns the temperature range, *i.e.* the difference between the hottest and the coldest month.

AVERAGE TEMPERATURE: $^{\circ}$ F.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Bergen ..	34	34	36	42	49	55	58	59	52	45	39	35
Brest ..	45	45	47	50	55	60	65	64	61	56	50	46
Paris ..	36	38	43	50	56	62	65	64	58	50	42	37
Lisbon ..	50	52	54	58	61	67	70	71	68	62	56	51
Berlin ..	30	33	38	47	57	64	66	66	68	49	39	33
Astrakhan	19	21	32	48	64	73	77	74	63	50	37	26
Moscow ..	13	14	23	38	54	61	66	62	52	41	28	19
Archangel	7	9	18	30	41	54	60	57	47	35	21	11
Gibraltar	55	56	57	61	65	70	73	75	72	66	60	56
Naples ..	47	48	51	56	64	70	75	75	70	63	55	49
Milan ..	32	38	46	55	63	70	75	73	66	56	44	36
Athens ..	49	50	53	59	68	76	81	80	74	67	57	52

AVERAGE RAINFALL: INCHES

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Bergen ..	7.5	5.8	5.8	3.4	4.3	3.7	6.3	7.3	10.5	9.5	8.2	8.3
Brest ..	2.6	2.4	2.2	2.1	2.4	1.5	1.3	1.9	2.5	3.4	3.1	3.7
Paris ..	1.4	1.3	1.5	1.7	1.8	2.2	2.1	2.2	2.0	2.4	1.8	1.8
Lisbon ..	3.6	3.5	3.4	2.6	2.0	.7	.1	.3	1.3	3.2	4.2	3.8
Berlin ..	1.5	1.5	1.7	1.5	1.9	2.5	3.0	2.2	1.7	1.9	1.7	1.8
Astrakhan	.5	.3	.4	.5	.7	.7	.5	.5	.5	.4	.4	.5
Moscow ..	1.3	1.1	1.2	1.5	1.9	2.3	3.0	2.9	2.2	1.7	1.7	1.6
Archangel	.8	.7	.8	.7	1.0	1.5	2.2	2.1	2.0	1.5	1.1	.8
Gibraltar	5.0	4.2	4.8	2.7	1.7	.5	—	.3	1.4	3.3	6.4	5.6
Naples ..	3.7	2.9	2.8	2.6	2.0	1.4	.6	1.1	2.9	4.6	4.5	4.4
Milan ..	2.5	2.3	2.7	3.5	4.1	3.3	2.8	3.2	3.6	4.8	4.4	3.0
Athens ..	2.0	1.5	1.3	.8	.8	.7	.3	.4	.5	1.7	2.9	2.4

VEGETATION AND ANIMALS

206. The *natural* vegetation of Europe may be divided into five regions.

(1) The tundra or frozen marshes of the extreme north, growing only moss, lichens, and dwarf trees.

(2) Sub-arctic forest of evergreen trees, chiefly fir and pine, covering most of Scandinavia and northern Russia, and reappearing on the mountains of central Europe.

(3) Temperate forest of deciduous trees (oak, elm, beech, walnut, etc.). This forest once covered nearly all central Europe, but has been largely cleared to make room for agriculture.

(4) Sub-tropical forest of southern evergreens (olive, cork-oak, mulberry, myrtle, etc.), formerly covering a large part of the Mediterranean region. Much of this forest has also been destroyed.

(5) The steppes or treeless plains of south-east Russia, the only large area of Europe that is too dry for the growth of trees.

207. Of the cultivated plants of Europe the most important are the cereals or grain-producing grasses.

Wheat is grown chiefly in the Mediterranean countries and the temperate forest zone. South Russia, France, and the Hungarian Plain produce especially large quantities of wheat. In the Mediterranean countries wheat is generally harvested in June, but in northern Europe (Scotland, Sweden, Russia) not till September.

Rye and oats can grow in poorer soils and damper climates than wheat, and are the chief grain-crops of northern Europe generally.

Maize (Indian corn), on the other hand, requires a warmer climate, and in Europe is largely grown only in northern Italy, Romania, and Hungary.

Sugar-beet is an important product of central Europe, especially in Germany, France, Poland, Czecho-Slovakia, and Russia.

The chief fruits of central Europe are the apple, pear, plum, and cherry; of the Mediterranean countries the grape, olive, orange, lemon, and fig. Of these the grape-vine has a wider range than any of the others; it can be successfully cultivated

as far north as about lat. 50° N. in west and central Europe. France is by far the most important wine-producing country, followed by Spain, Portugal, Italy, and Germany.

Southern Spain, Italy, and Sicily are the chief European areas growing oranges and lemons. Olives and olive-oil are an important article of food throughout the Mediterranean area, apart from their use in soap-making.

208. The domesticated animals of Europe are much the same as those of the British Isles. Few of the larger wild animals survive, but the wild boar and brown bear are still found in the forested mountains of central Europe, and wolves are common in Russia. The reindeer has been domesticated by the Lapps of the extreme north, where few animals can exist.

The Mediterranean area, owing to its comparative dryness, is rich in sheep, but has few cattle, except in northern Italy, where pasture is exceptionally good.

MINERALS

209. Fig. 48 shows the most important coal-fields of central Europe.

The Belgian coal-field stretches from a little west of Cologne right across southern Belgium into France. This coal-field supplies fuel for a group of large towns, manufacturing textile fabrics chiefly, in western Belgium and north-east France.

The Ruhr coal-field, on the river Ruhr, a small right-bank tributary of the Rhine, supplies another group of large towns, making textiles and iron and steel goods.

The other coal-fields shown in the figure are the Saarbrücken (on the Saar, a tributary of the Moselle) and Silesian coal-fields, and smaller fields in Bohemia and Saxony, near Prague and Chemnitz respectively.

In eastern Europe there are coal-fields (i) south of Moscow, around Tula, the "Sheffield" of Russia, (ii) in the valley of the Donetz, the chief tributary of the Don, (iii) in Poland, (iv) in the Ural mountains, near Perm.

210. Iron ore is found on or near most of the coal-fields above mentioned, but the most important iron ore deposits in Europe are somewhat remote from the chief coal-fields,

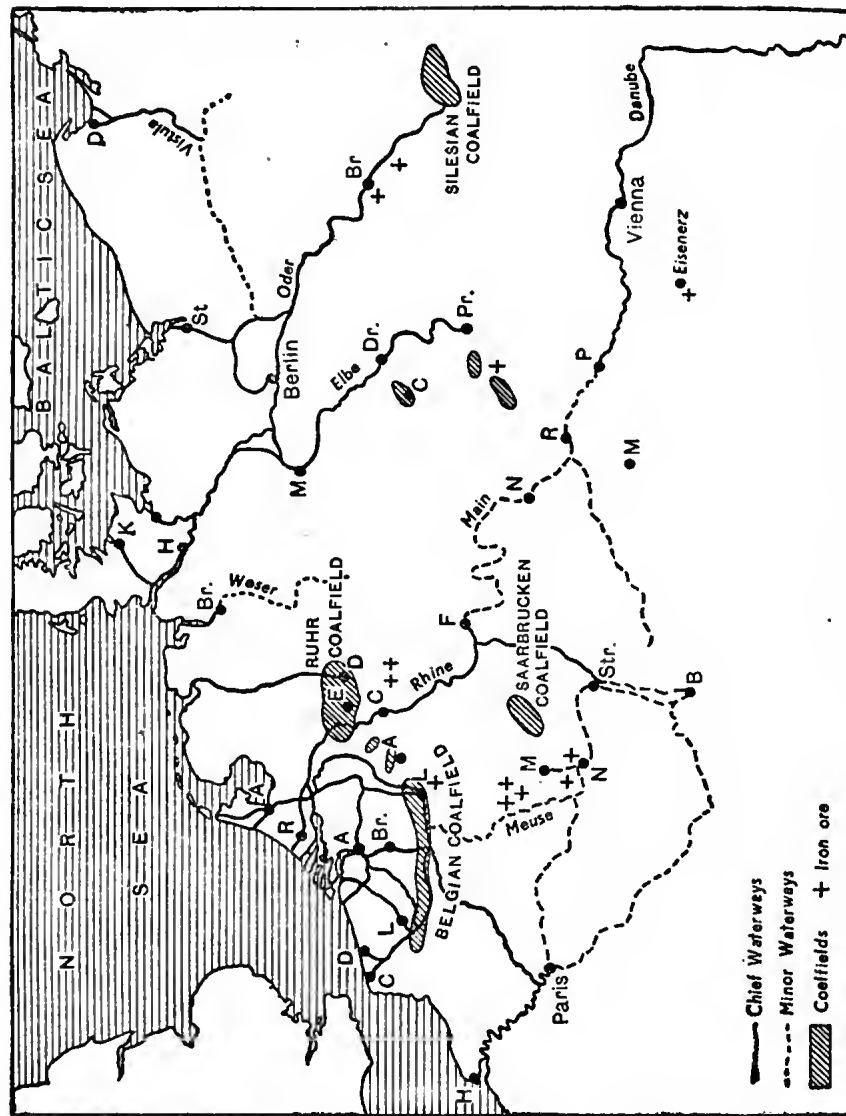


Fig. 48. CENTRAL EUROPE.

(i) in Luxembourg, a small independent state between France, Belgium and Germany, and in the adjoining French province of Lorraine; (ii) in northern Spain, the ore being exported (chiefly to England) from Bilbao, Santander, and San Sebastian; (iii) in Sweden, where the chief mines are at Dannemora, north of Stockholm, and at Gellivara, beyond the Arctic Circle.

The natural port of Gellivara is Lulea, at the head of the Baltic, but as this is ice-bound for several months every winter a railway has been built across the peninsula to Narvik, opposite the Lofoden Islands, thus providing Gellivara with a port which is always accessible.

Swedish iron ore is of the highest quality, and is largely exported to Sheffield.

Southern Europe is rather poor both in coal and iron, but the latter is mined in Elba, Sardinia, and Greece.

211. Spain is one of the most important mineral-producing countries in Europe. Besides its large export of iron ore, it also contains the chief copper ores of Europe in the mines of Rio Tinto in the south-west, exporting from Huelva. The Sierra Morena is rich in mercury (at Almaden) and lead.

Metallic ores are also abundant in the Harz Mountains (copper, silver, lead); in the Ural Mountains (platinum, copper, gold); in the Eastern Alps at Idria (mercury); and in Silesia (zinc).

Rock-salt is found in Transylvania, in Galicia (Wieliczka), and in Prussia (Stassfurt, south of Magdeburg on the Elbe).

The chief mineral of Italy is sulphur, mined in Sicily, where it has been produced by the eruptions of Etna.

Romania has the only important petroleum wells in Europe, on the outer slopes of the Transylvanian Alps.

OCCUPATIONS, INDUSTRIES, AND TOWNS

I. SCANDINAVIA AND DENMARK

212. The only parts of this region where any considerable area is fit for agriculture are Denmark, which is everywhere less than 600 feet high, and the lowland of southern Sweden. Barley, oats, rye, and cattle are raised, and dairy products, especially butter and eggs, are largely exported.

The chief wealth of Scandinavia is in its iron ore (Art. 210) and its immense forests of pine and fir, which have given rise in Sweden to large manufactures of joinery, wood-pulp (for paper), and matches. The extreme barrenness of most of Norway has driven the Norwegians to earn their living on the sea, and fish form the most important export of the country after timber. Electro-chemical industries based on water-power (the manufacture of carbide, explosives, and fertilisers) are important in both Norway and Sweden.

The chief ports of Norway are **Oslo**, the capital and outlet of the Glommen valley, and **Bergen**, the chief centre of the fish trade. Trondhjem, further north, is an important tourist centre, and Hammerfest, the most northerly town in the world, is in "The Land of the Midnight Sun," viz. beyond the Arctic Circle.

The two chief ports of Sweden are **Stockholm**, the capital, the "Venice of the North," built on islands between the sea and Lake Mälär, and **Göteborg** on the Cattegat.

The only large town in Denmark is **Copenhagen**, on the island of Zealand, commanding the Sound, the only entrance into the Baltic navigable by large ships.

213. Iceland. This island, about as large as Ireland, is just south of the Arctic Circle, and is nearer America than Europe. It is an independent state under the same king as Denmark.

The population is very small, as a large part of the area is occupied by mountains, snowfields, and plateaus of lava. Hekla is an active volcano. There are many hot springs and geysers.

The climate is mild in the south-west, owing to the Gulf Stream Drift, and cattle and sheep are reared, but the island is chiefly important as a fishing centre. The only town is Reykjavik.

2. RUSSIA

214. Russia is mainly an agricultural country, though manufactures are increasing in the large towns. The richest part of the country is the "black earth" region (called the Ukraine by the Russians) south of Moscow, between the Dnieper and the Don. This is the great wheat area. Rye, oats, flax, and hemp are also grown, and there is much timber in the north. The steppes of the south-east support many cattle and sheep.



Exclusive News Agency.

CEYLON: GIANT BAMBOOS IN THE PERADENIYA GARDENS, KANDY.

Russia has access to the Baltic at Leningrad, near the mouth of the Neva, protected by the naval fortress of Kronstadt. Leningrad was, until 1917, the capital and largest town. To the north is Finland, a land of lakes and forests, exporting wood and wood-pulp for paper making through Helsingfors. South of the Gulf of Finland are the three Republics of Estonia, Latvia, and Lithuania, which joined the Union of Soviet Socialist Republics in 1940. They are level, agricultural and forested countries, exporting grain, timber, flax and hemp through their respective ports of Reval, Riga and Memel. To the west of the U.S.S.R. is the Republic of Poland, reconstituted after the War of 1914-18 from provinces carved out of Russia, Germany and Austria.

Archangel exports the timber of the northern forests during the few months of the year when it is free from ice.

215. The chief Black Sea ports of Russia are Odessa and Kherson, both engaged principally in the export of wheat. Sevastopol in the Crimea is a naval fortress.

The only European port on the Caspian is Astrakhan at the mouth of the Volga, a centre of fishing, especially for sturgeon.

The chief inland towns of Russia are Moscow, the present capital, an important railway and manufacturing centre; Tula, south of Moscow, in the centre of a coal and iron district, with manufactures of rifles, hardware, and machinery; Kiev and Kharkov, great agricultural centres in the most fertile part of Russia, in the valleys of the Dnieper and the Donetz respectively.

On the Volga are to be found Saratov, a centre of tobacco plantations; Samara, at the junction of two important Asiatic railways (see Art. 266); Kazan; and Nijni-Novgorod, at the junction of the Oka and Volga. The latter is famous for its great annual fair, to which traders come from all parts of Asia. Perm and Ekaterinburg are the chief towns of the Ural mining district (Arts. 209, 211).

3. CENTRAL EUROPE

(a) France and Belgium

216. The Central Plateau of France is bleak and bare, but on the whole the country is extraordinarily fertile. France grows more wheat than any other European country

except Russia. The best wheat area is in the broad plain of the middle Loire, between the Central Plateau and the hills of Normandy. Normandy grows much fruit, especially apples.

There are four great wine-producing districts in France: (i) **Champagne**, the basin of the upper Seine and Marne. The chief town is Reims, which is also a woollen-manufacturing town. (ii) **Burgundy**, the basin of the Saône. The chief town is Dijon, an important railway centre. The fortresses of Belfort and Besançon guarded the French side of the Burgundy Gate, but since France recovered Alsace (1919), they are less important. (iii) The basin of the **Garonne** produces claret and cognac (brandy). The chief town and port is Bordeaux. Inland is Toulouse (Art. 192). (iv) The **Moselle valley** (Art. 219).

The lower Rhône valley is largely devoted to the culture of the silkworm, and Lyons, at the junction of the Rhône and Saône, is the chief silk-manufacturing town in the world. Saint-Etienne, not far from Lyons, but in the Loire valley, on a small coal-field, makes fire-arms and silk ribbons. See also Art. 196.

217. Paris is the natural centre of northern France, situated on a navigable river, close to the junction of its main tributary, and midway between the sea and the southern and eastern highlands. The town has many manufactures, and produces especially objects of luxury, fashion, and art.

Paris can be reached by small steamers, and Rouen by larger vessels, but the great port of northern France is **Le Havre**, on the north side of the Seine estuary, with daily steamers to Southampton.

To the west of the lower Seine are the two hilly provinces of **Normandy** and **Brittany**. The former is well wooded, and is famous for apples and cider. Brittany is very similar to Cornwall, with much barren moorland and a few fertile areas in the interior, and a picturesque rocky coast, with many small islands. Many of the Bretons are fishermen, working not only in the coastal waters (sardines and tunny), but as far away as Iceland and the Grand Banks of Newfoundland. Brest and Lorient in Brittany, and Cherbourg in Normandy, at the end of the Cotentin Peninsula, are naval fortresses.

218. To the north-east of the lower Seine, partly in France and partly in Belgium, extending as far as the mouth of the Scheldt, is one of the most important industrial regions in Europe, using the coal of the Franco-Belgian coal-field and the iron of Luxembourg and the Moselle valley, and importing large quantities of flax (Baltic States), cotton (United States), and wool (Argentina).

The chief textile manufacturing towns are Rouen and Ghent (cotton), Roubaix, Amiens, and Reims (wool), Lille (cotton and linen), Tournai and Courtrai (linen), Valenciennes (lace), Cambrai (linen), and Brussels (lace). The last-named town is the capital of Belgium, which is the most densely populated independent country in Europe. Liège, on the Meuse, near the centre of the coal-field, has important iron manufactures, especially of fire-arms. Mons, Charleroi, and Namur make hardware and machinery. Glass and chemicals are other products of the Belgian coal-field.

The ports Le Havre, Dieppe, Boulogne, Calais, Ostend, and Flushing are all packet-stations connected with the English ports from Southampton to Harwich. The chief ports for ocean-going steamers, however, are Dunkirk, the only North Sea port of France, and Antwerp on the Scheldt. The position of the latter is in many respects similar to that of London, but Antwerp has behind it a very extensive system of inland waterways (Fig. 47). A train-ferry runs between Harwich and Zeebrügge.

(b) The Rhine and Switzerland

219. Rotterdam, with the Hook of Holland for passenger steamers (from Harwich), is the natural inlet and outlet for the sea-going trade of the Rhine basin. Amsterdam, the commercial centre of Holland (famous for diamond-cutting), faces the shallow Zuider Zee (*i.e.* Southern Sea, to distinguish it from the North Sea), but a ship-canal (the North Sea Canal) connects it with the North Sea at IJmuiden. The Hague is the political capital of Holland.

Holland is not a great manufacturing country like Belgium, but it is a great commercial country, owing to its control of the mouths of the Rhine and Maas, and its possession of rich colonies in the East Indies. Its industries, such as sugar refining, petroleum refining, cocoa and margarine

manufactures, are largely based on imported "colonial wares." The country is famous for its gardens, especially for the production of bulbs, which are largely exported. Haarlem is an important centre of bulb cultivation. Holland, like Denmark, is a great dairy country, exporting butter, cheese, and condensed milk. Over one-third of the country is below sea-level. A part of the shallow Zuider Zee is being reclaimed by embanking and pumping out the water, and when the work is completed—perhaps about 1950—a new province of about 800 square miles will have been added to Holland.

In the German part of the lower Rhine basin there is a cluster of industrial towns on the Ruhr coal-field (Art. 209)—Dortmund, a mining and iron-smelting town, Essen, with the great Krupp steel works, Elberfeld, Barmen, and Krefeld, with wool and silk manufactures, and Düsseldorf, a great river port. Farther up the river is Cologne, with a famous cathedral and scent manufacture.

The basin of the middle Rhine is more agricultural than industrial, producing much wine, wheat, and timber. The country is much visited by tourists for its scenery and historical associations, and there are numerous health resorts in the mountains. The chief towns are Mainz and Mannheim on the Rhine, at the confluence of the Main and Neckar respectively; Frankfurt on the Main (once the chief banking centre of Europe); Nuremberg, on a sub-tributary of the Main, a very old commercial town famous for the manufacture of toys, pencils, and artistic metal-work; and Stuttgart on the Neckar, capital of Würtemberg. Strasbourg on the Ill, a fortress and railway town, was recovered by France from Germany in 1919, with the provinces of Alsace and Lorraine. It is the eastern terminus of the Marne and Rhine Canal.

The Moselle valley affords the easiest route between France and Germany. It is guarded on the French side by the great fortress of Metz, backed by Nancy and Toul.

220. Switzerland, though without coal and iron, has become an important manufacturing country, owing largely to the great water power of its rivers and falls, which is used in all kinds of industries. In the west of the country the making of watches and clocks is the chief industry. Geneva is the commercial centre of this manufacture, and was also the seat of the League of Nations. In the north are many

electro-chemical works and textile factories. Zürich is the chief manufacturing centre and the largest town in Switzerland. Basel, on the north-west frontier, is an important railway junction, with silk manufactures. The political capital of Switzerland is Berne, on the Aar, occupying a central position on the Swiss Plain, midway between Geneva and Zürich.

Switzerland has little agriculture but much good pasture, and exports large quantities of cheese and condensed milk.

The Alps are the "playground of Europe," and are visited annually by many thousands of tourists and invalids in search of mountain air. Lucerne, Interlaken, and Montreux are chiefly tourist resorts, Zermatt and Chamonix centres for Alpine climbers, and St. Moritz and Davos Platz health resorts.

(c) The Elbe Basin and Eastern Germany

221. The basin of the Elbe contains several of the chief towns of Germany, including the capital, Berlin, on the Spree, a tributary of the Havel. Berlin has a central situation on the northern plain, is connected by canals with both the Elbe and Oder, is a great railway centre, and the largest town in continental Europe.

On the Elbe itself are Hamburg, one of the greatest seaports in Europe, Magdeburg, manufacturing sugar from sugar-beet, one of the most important crops of this part of Germany, and Dresden, famous for music and art, and the chief town of Saxony. This densely peopled state contains two other large towns, Chemnitz, manufacturing cotton, and Leipzig, the centre of the German book trade, and of great fur fairs.

On the Moldau stands Prague, the capital of Czechoslovakia, a state which has many manufactures, and is especially famous for glass and porcelain.

North-eastern Germany is on the whole somewhat barren and thinly populated compared with the west and south. Rye, potatoes, flax, and hemp are the chief agricultural products. Stettin, Danzig, and Königsberg are the ports of this region. Stettin is the nearest port to Berlin, and has shipbuilding works. Danzig and Königsberg export grain and timber. Danzig once separated from Germany and made a "free city" under the League of Nations, and Breslau, on the upper Oder, once the capital of the rich mining province of Silesia, have now been transferred to Poland.

(d) Poland

222. Poland, an ancient Slavonic kingdom, which was partitioned between Russia, Austria, and Germany in the eighteenth century, has been revived as an independent republic. It occupies most of the basin of the Vistula, with the upper part of the Dniester on the south-east, and Posen on the west. Danzig is Poland's natural outlet to the Baltic, but as this port was made a "free city" by the Treaty of Versailles the Poles constructed their own port at Gdynia, about 15 miles away. In 1945 Poland gained Danzig and a good deal of German Silesia in exchange for some eastern areas ceded to the U.S.S.R. The capital of Poland is Warsaw, at the head of steam navigation on the Vistula, and on the main route from Berlin to Moscow. A coal-field lies to the south-west of Warsaw, and Lodz has large textile factories. The Moravian Gate, giving access to Czecho-Slovakia and the Danube basin, is guarded by the fortress of Cracow.

(e) The Danube Basin

223. In the German part of the Danube basin the chief town is Munich, on the Isar, the capital of Bavaria. It is a magnificent city, a great art centre, an important corn market, and the greatest brewing town in the world. On the main river are the much smaller towns of Ulm, with a famous cathedral, Ratisbon (Regensburg), at the most northerly point on the river, and Passau, at the junction of the Inn and at the entrance of the Austrian Gate.

Vienna, the capital of Austria, is on a fertile plain at a point where the great waterway of the Danube meets important routes from Russia, through the Moravian Gate, from the Elbe basin, and from the head of the Adriatic, over the Semmering Pass. Vienna makes machinery, silk, and furniture. Graz, on the Mur, a tributary of the Save, is an iron-working town in the province of Styria.

The great plain of Hungary is one of the most fertile wheat-producing regions in Europe, and the chief industry is flour-milling. The chief towns are Budapest, the capital of the country, on the Danube at the northern edge of the plain, and Szegedin, on the Theiss, near the southern frontier. The southern part of the plain, from Szegedin to Belgrade, is now in Yugoslavia.

On the lower Danube the chief towns are Belgrade, capital of Yugoslavia, at the junction of the Sava, and Galatz, the chief seaport of the Danube, near the head of the delta. Bucharest, the capital of Romania, stands in the middle of the Wallachian Plain, a great corn and maize-growing region north of the river.

The valley of the Morava, which flows through Serbia, is important as a railway route (Art. 202).

4. SOUTHERN EUROPE

(a) The Balkan Peninsula

224. The only very large town in the Balkan Peninsula is Stamboul or Istanbul, probably better known under its ancient name Constantinople. It stands at the south end of the Bosphorus on a splendid natural harbour called the Golden Horn, and has a large commerce, collecting the products of Asia Minor and distributing them to Europe.

Istanbul was for many centuries the capital of the Eastern Roman Empire, and after 1453 of the Turkish Empire. When this Empire was made into a republic, however, the capital was removed to Ankara, in Anatolia.

The chief Black Sea ports of the peninsula are Constantza in Romania and Varna in Bulgaria. On the Aegean Sea is Salonika, near the mouth of the Vardar. The most important inland towns are Adrianople on the Maritsa, and Sofia, the capital of Bulgaria; both on the railway to Constantinople.

In Greece the only large town is Athens, the capital, a place of great historical importance. Its port is the Piraeus. Patras, at the entrance to the Gulf of Corinth, is the chief place of export of currants.

(b) Italy

225. The north of Italy is the most densely populated part of the country, and contains numerous large towns. The most important of these is Milan, which has a famous cathedral and great silk manufactures, and steel and engineering industries. Turin, farther west, is on the Mont Cenis route and also manufactures silk and motor cars. On the north of the plain are Verona and Padua, and on the south Bologna. Verona is at the point where the Brenner route descends to the plain, and crosses the railway from Milan to Venice.

Venice, built on islands in a lagoon guarded from the sea by sandbanks and from the land by marshes, was once the most important seaport in Europe and the capital of a great mercantile republic, almost monopolising the trade from Asia in silks, spices, and other luxuries; but commercially it is now of little importance.* Its great rival in the Middle Ages was Genoa, which, after a long period of decay, has in modern times again become important, owing to the opening of the Suez Canal and the cutting of Alpine tunnels.

On opposite sides of the peninsula of Istria are the ports of Trieste and Fiume. They have good harbours, but the country behind them is very mountainous and barren, and the routes to productive regions are long and difficult. Both belong to Italy, but Fiume is the chief outlet of Yugoslavia.

Spezia is the chief naval station of Italy. Carrara, near it, is famous for its quarries of white marble. Leghorn, celebrated for straw-plaiting, is the chief port of central Italy. It has superseded the old port of Pisa, now fallen into decay owing to the silting up of the mouth of the Arno. The chief town on the Arno is Florence, a town of brilliant history and great art galleries.

Rome, on the lower Tiber, is the capital of Italy. It has been a place of great importance for a much longer period than any other town in the world, being the centre first of the Roman Republic and Empire, and then, for a long period, of the Christian world. When Italy, after being for many centuries a medley of small republics, duchies, and kingdoms, achieved national unity in the nineteenth century, it was inevitable, for historical reasons, that Rome should become the capital.

Naples is the chief seaport of southern Italy and the largest town in the country, except Milan. Owing to its warm climate and the beauty of its surroundings, Naples is a favourite winter resort. Brindisi, on the "heel" of Italy, is a packet-station for Egypt and the Suez Canal. A considerable saving of time is effected by going to the East via Brindisi, instead of all the way by sea.

Sicily has three large towns, Palermo, the capital, exporting wheat and fruit, Messina, on the narrow strait of the same name, and Catania, exporting sulphur from Mount Etna.

* "Once did she hold the gorgeous East in fee,
And was the safeguard of the West . . ."
(Wordsworth, *On the Extinction of the Venetian Republic.*)

(c) Spain and Portugal

226. The Meseta is mainly pastoral, with wheat-growing in the valleys. Fruit (oranges, lemons, olives, the vine) is important in the south. Portugal has large forests of cork-oak. The only part of the Peninsula where there is much manufacturing (mainly cotton) is the province of Catalonia, north of the lower Ebro. The chief manufacturing town is Barcelona.

The seaports of the north of Spain, San Sebastian, Bilbao, Santander, are chiefly engaged in exporting iron ore, mainly to England. The chief towns of Portugal are Lisbon, the capital, at the mouth of the Tagus, and Oporto, at the mouth of the Douro. The latter exports the wine called "port" (after the name of the town).

The chief port of the south of Spain is Cadiz, a fortified naval harbour, with a large trade in the wine called "sherry" (so named from the town of Jerez, near Cadiz). The ports of the south-east of Spain, Malaga, Almeria, Alicante, Valencia, export wine and fruit.

The chief inland town of the peninsula is Madrid, the capital of Spain, on a tributary of the Tagus. Its importance is chiefly due to its very central position. Seville, on the Guadalquivir, is the capital of the very fertile province of Andalusia, famous for its horses and bulls, trained for the national sport of bull-fighting. Murcia is in the most tropical part of Europe, a district which in the rainless summer is almost a desert, but when artificially irrigated grows such tropical products as dates, cotton, and sugar-cane. Cordoba and Granada, in Andalusia, are celebrated for old Moorish buildings. Valladolid, in Old Castile, is an important wheat market and the commercial centre of the Douro basin.

Gibraltar, a strong British fortress, is on a rocky headland on the north side of the Strait of Gibraltar, opposite the Spanish fortress of Ceuta, in Morocco. Gibraltar is an important coaling port, and is the base of the British Atlantic fleet.

(d) Mediterranean Islands

227. The Balearic Isles belong to Spain. The largest island is Majorca, on which stands the capital, Palma. Oranges and olives are grown, and fishing (tunny and sardines) is important.

Corsica, capital Ajaccio, belongs to France, and Sardinia, capital Cagliari, to Italy. They are both very mountainous, and Sardinia contains valuable minerals, but the mines are very little worked. Wheat and wine are produced.

The small island of Elba contains the chief iron ores of Italy.

Sicily, the largest island in the Mediterranean, is fertile and densely populated, producing much wheat, wine, lemons, and oranges. It is mountainous in the north (Etna, an active volcano, 11,000 ft.), and slopes down to lowlands in the south-west. For towns see Art. 225.

To the north of Sicily lie the very volcanic Lipari Islands, and to the south the important island of Malta, a British colony and the headquarters of our Mediterranean fleet. It is an important link in the chain of British fortresses—Gibraltar, Malta, Aden—connecting England with India. The capital and port is Valetta.

The Ionian Islands, off the west coast of Greece, produce wine, olives, and currants. Their chief town is Corfu.

The Greek Archipelago is scattered over the Aegean Sea between Greece and Asia Minor. The islands are of little modern importance, though of great historical interest.

Crete, a large island south of the Archipelago, produces olives, raisins, and wine, and manufactures soap from olive oil. Its chief towns are Canea, the capital, and Candia, both on the north coast.

Cyprus, in the extreme east of the Mediterranean, is a British colony annexed from Turkey in 1914, and grows wheat, olives, and cotton. Its chief towns are Nicosia, the capital, and the port of Larnaka.

RAILWAYS

228. The European railway system is far too complicated for description in a short space. The most important international routes are shown in the map (Fig. 49), and details must be studied from an atlas.

Paris and Berlin are the leading towns of continental Europe in almost every respect, and have therefore naturally become great railway centres.

The following routes from Paris are shown on the map:

- (a) via Bordeaux and Valladolid to Madrid and Lisbon;
- (b) to Italy, (1) via Dijon, Lausanne and Milan (Simplon

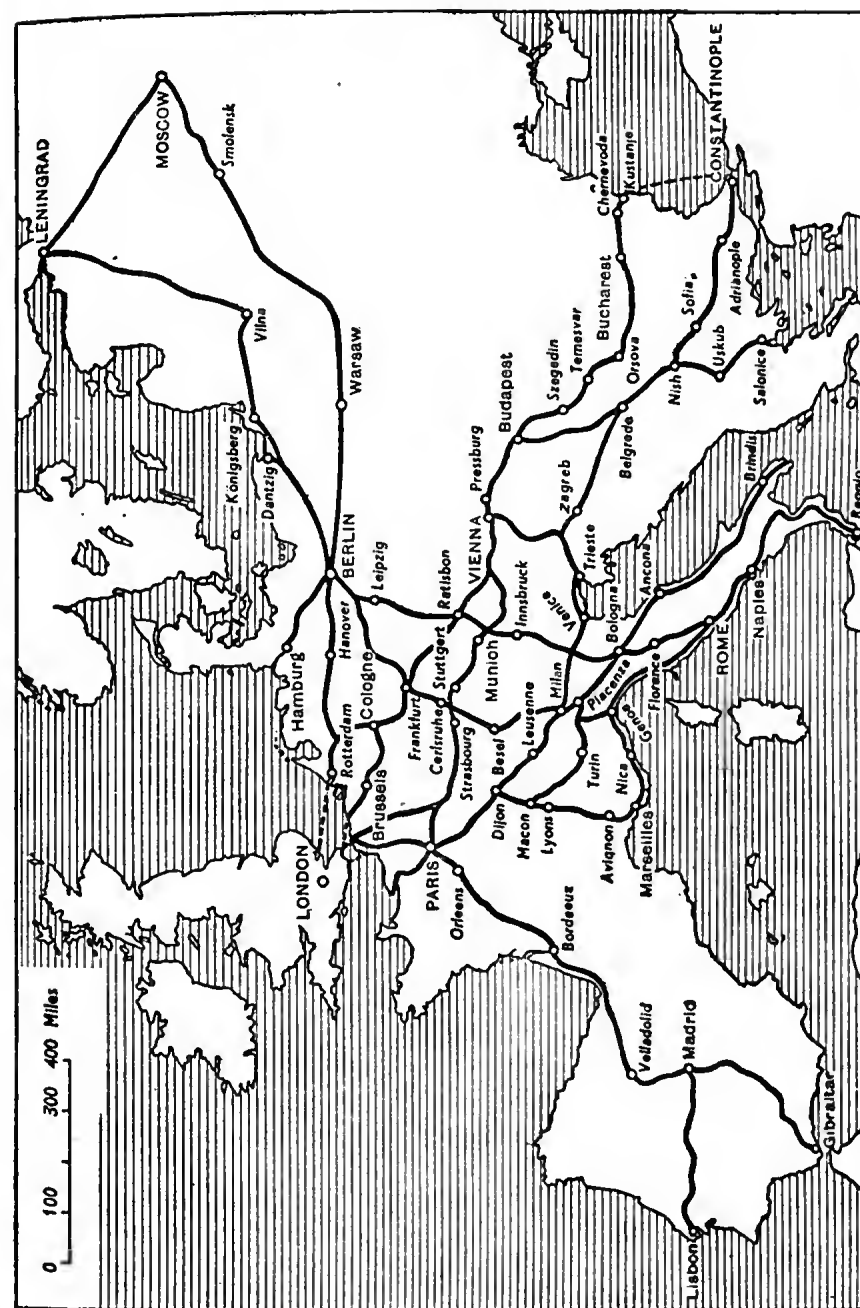


Fig. 49. EUROPEAN RAILWAYS.

route), (2) via Macon and Turin (Mont Cenis route), (3) via Marseilles and Genoa; (c) to Constantinople (the Orient Express) via Strasbourg, Munich, Vienna, Belgrade, Sofia. The rival route of the Simplon-Orient Express is via Paris, Dijon, Lausanne, Simplon Tunnel, Milan, Venice, Trieste, Zagrab, Belgrade.

The map (Fig. 49) does not show the most direct route from Paris to Berlin, which passes through Liège, Aachen, Cologne, and Hanover.

Routes from Berlin shown on the map are: (a) to Leningrad via Vilna; (b) to Moscow via Warsaw; (c) to Italy, (1) through Leipzig, Ratisbon, and Innsbrück (the Brenner route), (2) through Frankfort and Basel (the St. Gothard route).

Moscow is the great railway centre of Russia, with lines to Archangel, Leningrad, Warsaw, Odessa, Caucasia, Central Asia (through Samara and Orenburg), and the "Far East" (the Trans-Siberian Railway, Chap. XI.).

From Paris to Marseilles takes about 13 hours by train, from Ostend to Berlin about 15 hours, from Calais to Istanbul (Stamboul) about three days.

POLITICAL DIVISIONS AND POPULATION

229. The political map of Europe, almost unchanged since the Franco-Prussian War of 1870, was greatly altered by the First World War of 1914-18, and again by the Second World War which began in 1939.

The main effects of the First World War were very briefly to destroy the former Empires of Germany, Austria-Hungary, and Russia, to reduce their areas, to revive Poland and Finland as independent countries, to alter many boundaries in the Balkans, and to create a number of "succession states", *e.g.*, the Baltic States (Art. 214, 2nd par.), Czecho-Slovakia (an enlarged Bohemia), and Yugo-Slavia (an enlarged Serbia). France, Italy, Greece, and Rumania received considerable areas of territory from the defeated powers.

After the failure of the "League of Nations", which had been founded in 1919, with its headquarters at Geneva, to preserve the peace and to settle future disputes among nations, an uneasy peace broke down in 1939, and in the following two years Germany, helped later on by Italy, succeeded in conquering almost the whole of Europe, including Poland, Norway,

Denmark, France, the Low Countries, the whole of the Balkan Peninsula (except the very small area belonging to Turkey) and considerable areas of Western Russia. The only European countries which maintained a precarious "neutrality" were Eire, Sweden, Spain, Portugal and Switzerland. The war spread to North Africa, to North America, Australia, and the Far East, where Germany's ally, Japan, temporarily conquered Malaya and almost all the richly productive islands of the South-West Pacific.

No Peace Treaties have yet been signed (June, 1946), but it seems probable that the political divisions and boundaries of central and western Europe will be substantially as in 1937, including an independent Austria, although it is possible that Germany may be divided into several more or less independent areas.

In the east the Baltic Republics of Estonia, Latvia and Lithuania have joined the Union of Soviet Socialist Republics. The latter has also secured the former German port of Königsberg and a considerable area of eastern Poland. In exchange Poland has obtained Danzig and a large area in Silesia, including the important towns of Breslau, Gleiwitz and Beuthen.

230. There are about 400 million people in Europe, and nearly all of them belong to the white races of mankind.

They may be roughly divided into three great races—

(1) The Greco-Italic race in Spain, Portugal, France (partly), Italy, Greece, Rumania. Akin to these are the Celts of Brittany, Wales, Ireland, and the Scottish Highlands.

(2) The Teutonic race in Germany, Austria, Scandinavia, Denmark, the Low Countries, Great Britain, northern France.

(3) The Slavonic race in Russia, Bohemia, Poland, and most of the Balkan Peninsula, except Greece.

There has, however, been a great deal of mixture of races.

COUNTRIES OF EUROPE

A. WESTERN AND NORTHERN EUROPE

COUNTRY	GOVERNMENT	AREA Sq. Miles	POPULATION Millions	CAPITAL	POPULATION THOUSANDS	CHIEF EXPORTS	CHIEF IMPORTS
Portugal	Republic	35,000	7.8	Lisbon	707	Wine, cork, fruits	Coal, cotton, iron, wheat
Spain	Republic	195,000	25.5	Madrid	1100	Ores of iron, copper, and lead; wine, fruits	Coal, machinery, textiles
France	Republic	213,000	42	Paris	2800	Wine, textiles, <i>articles de Paris</i>	Wool, cotton, silk, coal, oil-seeds, timber
Belgium	Kingdom	12,000	8.2	Brussels	910	Coal, machinery, iron wares, linen	Wheat, wool, flax
Holland (The Netherlands)	Kingdom	13,000	9.1	The Hague	496	Butter, margarine, cheese	Iron and steel, textiles, grain, coal
Denmark	Kingdom	16,000	3.8	Copenhagen	840	Butter, eggs, meat	Textiles, coal, machinery, food-stuffs
Norway	Kingdom	125,000	2.9	Oslo	260	Wood and wood pulp, fish	
Sweden	Kingdom	173,000	6.5	Stockholm	600	Wood and wood pulp, iron ore, animal produce	
Finland	Republic	150,000	3.7	Helsingfors	300	Paper, timber, butter	

B. CENTRAL EUROPE

COUNTRY	GOVERNMENT	AREA Sq. Miles	POPULATION Millions	CAPITAL	POPULATION THOUSANDS	CHIEF EXPORTS	CHIEF IMPORTS
Germany (1939)	Nat.-Socialist "Reich"	230,000	78.5	Berlin	4300	Sugar; metal and wood manufactures, textiles	Textiles, machinery, coal
Austria	Republic	35,000	7	Vienna	1800	Paper, scientific and electrical apparatus	Textiles
Switzerland	Federal Republic	16,000	4.3	Berne	121	Silk, cotton, clocks, and watches	Raw silk and cotton, coal, iron, food-stuffs
Italy	Republic	125,000	45	Rome	1300	Raw silk; silk manufactures, olive oil, hemp, flax, sulphur, wine	Raw cotton and wool, coal, grain, machinery, timber
Poland	Republic	150,000	34	Warsaw	1200	Grain, flax, timber	Coal, machinery
Czechoslovakia	Republic	52,000	14.6	Prague	848	Sugar, glass, timber	Raw cotton and wool, food-stuffs
Hungary (1940)	Republic	60,000	15	Budapest	1100	Wheat and flour	Textiles, coal
U.S.S.R.— (1) Estonia	Union of Socialist Republics	18,000	1.1	Reval (Tallinn)	135	Flax, hemp, grain, timber	Coal, machinery, tea
(2) Latvia		25,000	1.5	Riga	340		
(3) Lithuania		20,000	2.4	Kovno	110		

C. EASTERN EUROPE

COUNTRY	GOVERNMENT	AREA SQ. MILES	POPULATION MILLIONS	CAPITAL	POPULATION THOUSANDS	CHIEF EXPORTS	CHIEF IMPORTS
U.S.S.R.— (1) Soviet Russia *	Union of Socialist Republics	7,800,000	112	Moscow	4000	Wheat, eggs, tim- ber, flax	Raw cotton, tea, iron, machinery
(2) Ukraine ..		170,000	32	Kharkov	530		
(3) White Russia		49,000	5	Minsk	240		
Romania ..	Kingdom	100,000	20	Bucharest	650	Wheat, maize, fruit	Textiles, metal manufactures, coal
Bulgaria ..	Kingdom	40,000	6	Sofia	360		
Yugoslavia ..	Republic	94,000	16	Belgrade	260		
Albania ..	Kingdom	12,000	1	Tirana	30	Grain, fruit, ani- mals —	
Greece ..	Kingdom	50,000	7.5	Athens	400	Currants, wine, olive-oil, fruit	
Turkey .. (in Europe)	Republic	9,000	14	Ankara (Asia Minor)	75	Opium, tobacco, cotton, raisins, carpets	

* Including Asiatic Territory.



Will F. Taylor.

JAPAN: TRANSPLANTING GROWING RICE ON A FARM NEAR KYOTO. Rice is planted under water, and when partly grown transplanted to dry land.

LARGE TOWNS IN EUROPE

(Not including the Capitals given in the above Tables)

	Population Thousands		Population Thousands
FRANCE (1936)		ITALY (1936)	
Marseilles	914	Milan	1117
Lyons	568	Naples	870
Bordeaux	258	Turin	644
Nice	241	Genoa	632
Toulouse	213	Palermo	420
Lille	200	Florence	325
		Bologna	275
GERMANY (1939)		Venice	265
Hamburg-Altona	1682	Catania	250
Munich	828	Trieste	250
Cologne	768		
Leipzig	702	SPAIN (1941)	
Essen	660	Barcelona	1120
Dresden	625	Valencia	450
Frankfurt-on-Main	547	Seville	300
Düsseldorf	540		
Dortmund	537	HOLLAND (1939)	
Hanover	473	Amsterdam	794
Stuttgart	460	Rotterdam	612
Nürnberg	431		
Duisburg-Ruhrort	431	PORTUGAL (1940)	
Wupperthal	398	Oporto	260
Bremen	342		
Chemnitz	335	SWEDEN (1943)	
Magdeburg	334	Göteborg	288
Gelsenkirchen	313		
Bochum	303	TURKEY (1940)	
Mannheim	284	Istanbul (Constanti- nople)	798
Kiel	272		
Stettin	268	U.S.S.R. (Europe) (1939)	
		Leningrad	3200
SWITZERLAND (1941)		Kiev	845
Zürich	336	Gorki (Nijni Novgorod)	620
CZECHO-SLOVAKIA (1930)		Odessa	605
Brno (Brünn)	263	Rostov	510
GREECE (1936)		Dneipropetrovsk	500
Piraeus	287	Stalino	462
Salonika	238	Stalingrad	448
POLAND (1939)		Kuibyshev (Samara)	380
Lodz	670	Saratov	370
Breslau	600	Königsberg	368
Danzig	410		
Krakow	260	BELGIUM	
		Antwerp	300
		Ghent	200

TOWNS IN EUROPE

with between 100,000 and 200,000 Inhabitants

(Not including Capitals)

FRANCE	POLAND	CZECHO-SLOVAKIA
Strasburg	Wilno	Pilsen
Nantes	Katowiec	Bratislava
Saint-Etienne	Gydnia	
Roubaix	Lublin	
Le Havre	Gleiwitz	
Rouen		SPAIN
Nancy		Malaga
Toulon	U.S.S.R. (Europe)	Murcia
Rheims	Kazan	Saragossa
Clermont-Ferrand	Krasnodar	Cartagena
	Grozny	Bilbao
	Taganrog	Granada
	Orenburg	Cordova
	Smolensk	Valadolid
GERMANY	Krasnodar	
Halle-on-Saale	Orenburg	SWITZERLAND
Aachen	Nikolaeiv	Basel
Brunswick	Kherson	Geneva
Crefeld	Vitebsk	
Kassel	Vilna	BELGIUM
Karlsruhe		Liège
Wiesbaden	HUNGARY	
Erfurt	Szeged	
Mainz	Delreczen	
Lübeck		HOLLAND
Mülheim-on-Ruhr		Utrecht
Saarbrücken	ITALY	Haarlem
Gräz	Messina	Groningen
Augsburg	Leghorn	Eindhoven
Oberhausen	Bari	
Solingen	Brescia	SWEDEN
München-Gladbach	Ferrara	Malmö
Münster	Padua	
Bielefeld	Taranto	
Bonn	Verona	NORWAY
Ludwigshafen	Reggio	Bergen
Würzburg	Spezia	
Freiburg		
Darmstadt		
Rostock		

QUESTIONS ON CHAPTER X

1. Mention in order the chief natural features, political divisions, towns, and anything of special interest that would be passed in a voyage from Bordeaux to Hamburg.

2. Give the positions of the following places, stating for what each is noted: Belgrade, Budapest, the Crimea, Dresden, Florence, Odessa, Riga, Strasbourg, Upsala.

3. Name three important tributaries of the Danube, and describe the course of each and the character of the country through which it flows.

4. Name in order the countries which touch the Baltic Sea: and give the names and positions of two gulfs and two islands in that sea. In what way is commerce in the Baltic impeded by physical conditions?

5. Insert on the given map (Russia) the Caucasus Mountains and the Valdai Hills. Trace the courses of the Volga and Petchora and any important tributaries of them. Name three fresh-water lakes, and indicate the regions of tundras and steppes. Mark Astrakhan, Corfu, Cracow, Danzig, Moscow, Reval, Samara; and the track of the Siberian Railway as far as the Asiatic border.

6. Give a brief geographical description of the Balkan Peninsula, south of the Danube and the Save. Name the chief productions and indicate the position and importance of five principal towns.

7. Draw a sketch-map of the Iberian peninsula. Name Capes Finisterre, Roca, and Tarifa; Trafalgar Bay; the Castilian Mountains, the Sierra Morena; the rivers Douro, Ebro, and Tagus; and Barcelona, Bilbao, Corunna, Granada, Lisbon, Oporto, Seville.

8. On the given map (Iberian peninsula) mark the boundary of Portugal; three mountain ranges (*not* the Pyrenees); the Tagus, Ebro, and Guadalquivir, and one town on each of these rivers; also the towns Badajoz, Barcelona, Bilbao, Cadiz, Granada, Oporto, Pamplona, Valencia. Insert the names of three capes.

9. Give the positions and a brief account of the following islands, and name the country to which each of them belongs: (a) Corfu, (b) Corsica, (c) Iceland, (d) Majorca, (e) Malta.

10. Describe the physical features, and name the products and chief towns, of *either* Holland *or* the region drained by the river Po and its tributaries.

11. Describe a journey from London to Venice, *either* (a) by a quick sea passage, *or* (b) by railway across Europe. Mention four important towns or ports on the route you choose. Name the countries passed, and describe those physical features which would be seen. Give the approximate time necessary for the journey.

12. Draw a simple sketch-map of the Alps, the Apennines, and the Carpathians (using thick black lines): insert the Little Carpathians and Rhaetian Alps; the lakes Garda, Geneva, and Maggiore; mark with a cross the points at which the Rhine and Rhône rise; mark Mont Blanc, Monte Corno, Trieste, and Vienna.

13. Draw a sketch-map of the English Channel. Mark the Downs, Dunkirk, Jersey, St. Malo. Mark three usual passenger-routes between England and France, naming the ports at each end. Insert the names of two capes and two river-mouths on the English coast and also on the French coast.

14. Name the rivers shown in Fig. 47, the towns marked in Fig. 48, and the mountains and lakes in Fig. 46.

15. On the given map (Italy) insert Monte Corno (Gran Sasso d'Italia), the Dinaric Alps, and the Tiber; two important naval stations, three lakes, two active volcanoes, and any city destroyed by earthquake in recent years. Mark Brindisi, Cagliari, Florence, Palermo, Venice. Show by a dotted line the direct steamer-route between Venice and Brindisi, and estimate its length in miles or in kilometres.

16. Draw a sketch-map of the North Sea coast-line from Calais to the Skaw of Denmark. Mark the Dogger Bank, the Frisian Islands, and the Skager Rack; Calais, Heligoland, and the Hook of Holland.

17. Describe the nature of the country traversed by the Danube. What makes this river important? Name four large towns upon its banks and give an account of their industries.

18. Describe the climate of the Russian Steppes, and compare it with that of Brittany.

19. Where is mining chiefly carried on in the Mediterranean region? What are the principal minerals?

20. Name two areas in continental Europe which are densely peopled, and two which have very few people. Give brief reasons for the differences.

21. Show how the chief occupations of the inhabitants of two of the following areas are influenced by geographical conditions: Brittany, Hungary, Norway, Peninsular Italy.

22. Choose two European ports on the Mediterranean Sea (but not in the same country) and account for their importance.

CHAPTER XI

ASIA

GENERAL

231. The area of Asia is over seventeen million square miles, nearly one-third of the land area of the whole world. The continent extends from Cape Romania, in the Malay Peninsula, within about 1° of the equator, to Cape Chelyuskin, in the Taimir Peninsula, more than 10° north of the Arctic circle. The extreme points on the west and east are Cape Baba in Asia Minor, and East Cape on Bering Strait, and between these there are 160° of longitude.

Asia is joined to Europe and Africa by land. It is only separated from North America by about forty miles of shallow water in Bering Strait; and it is almost connected with Australia by the great East Indian Archipelago. Thus Asia is in close proximity to all the other continents except South America.

Asia is a continent of superlatives. It contains the highest mountains (Himalaya and Karakoram), the lowest depression (Dead Sea), the largest and loftiest plateaus (Tibet, etc.), the greatest area of inland drainage, with the largest salt lakes (Caspian and Aral Seas); the most extreme climate; the largest population (more than twice as much as Europe), and the most ancient civilisations.

COASTS AND SEAS

232. The north coast is generally low. The western rivers, Ob and Yenisei, form large estuaries; the eastern rivers form deltas.

The east coast is almost wholly bordered by mountains, except in northern China. A remarkable line of volcanic islands lies off the coast from Kamchatka to Borneo. The seas between these islands and the mainland are mostly fairly shallow, but on the outer side the sea floor falls steeply to very great depths.

The partially enclosed seas of the east coast are, from north to south, the Sea of Okhotsk, the Sea of Japan, the

Yellow Sea, with the Gulf of Chihli, and the South China Sea, with the Gulfs of Tongking and Siam. Find from a map the names of the islands and peninsulas which surround these seas.

Like Europe, Asia has three large mountainous peninsulas in the south, Arabia, India, and Indo-China. The last of these has projecting from it the long narrow Malay Peninsula, which is less than fifty miles wide at the Isthmus of Kra.

The coasts of India and Arabia are generally steep, with few indentations, and have deep water near them. The Persian Gulf, however, is shallow, and is being filled with silt from the rivers Tigris and Euphrates.

The Mediterranean and Black Sea coasts of Asia are also mountainous. In fact, in the whole continent, outside Siberia, there are no extensive low coast plains, except the deltas of the great rivers.

LAND-RELIEF

233. The great *Siberian Plain* occupies the north of the continent. It is similar in character to the Russian Plain, from which it is separated by the *Ural Mountains*, which, however, are of no great height. The plain is widest and flattest in the west in the basins of the Ob and Yenisei. Towards the east it becomes narrower and more hilly.

To the south of western Siberia is a great region of steppes and deserts, called *Turan*, or Russian Turkistan, extending from the Caspian Sea to Lake Balkhash. This is a region of inland drainage, its rivers flowing into large salt lakes.

234. Central Asia is a region of immense mountain ranges and plateaus (Fig. 50). The *Pamir Plateau*, or "roof of the world," is a "knot" from which many ranges diverge, chiefly towards the east.

The southern edge of the Siberian Plain is formed by the long line of the *Tien Shan*, *Altai*, and *Yablonoi* mountains. To the south of these is a broad belt of lower but still high ground, of which the western half (Chinese Turkistan) is called the *Taklamakan Desert*, or the Tarim basin, and the eastern half (Mongolia) the *Desert of Gobi*, or Shamo. These deserts are farther from the equator than most other deserts of the world, and their dryness is chiefly due to their very great distance from the sea.

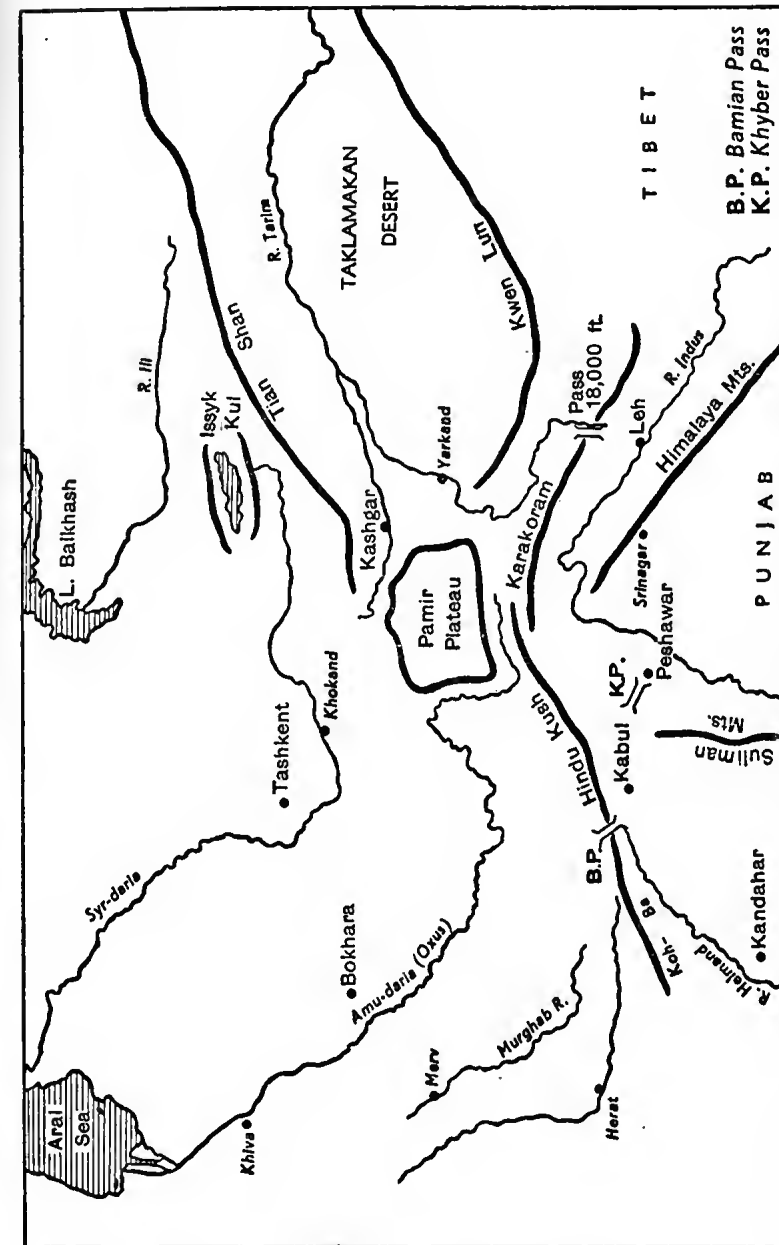


Fig. 50. MOUNTAINS OF CENTRAL ASIA.

These deserts are separated by the Kwenlun range (over 20,000 feet high) from the *Plateau of Tibet*, the highest inhabited region in the world (12,000 to 15,000 feet).

In the south of Tibet and the extreme north of India (Kashmir and Nepal) are the *Karakoram* and *Himalaya* ranges, the highest mountain ranges in the world, Mount Everest in the Himalayas reaching 29,140 feet, and many other peaks over 26,000 feet. On the south the Himalayas slope very steeply down to the low plain of the Ganges. The passes of the Himalayas are mostly higher than the highest peaks of the Alps.

235. To the south-west of the Pamirs is another plateau region of Persia, stretching from the Indus to the Tigris, and from the Persian Gulf to the Caspian. On the east are the

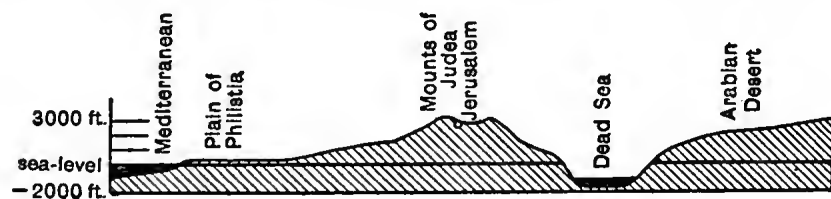


Fig. 51. SECTION ACROSS SOUTHERN PALESTINE.
(Vertical Scale exaggerated about 10 times.)

Suliman mountains, and on the north the *Hindu Kush*, *Khorasan*, and *Elburz* Mountains (Mount Demavend, 19,000 feet). To the north-east of these is the *Plateau of Armenia* (Mount Ararat, 17,000 feet), which is only separated by the narrow valley of the Kur from the *Caucasus* Mountains (Mount Elbrus, 18,500 feet).

Asia Minor is also a plateau-land at a lower level. The chief mountains are the *Taurus* range in the south-east.

The Persian Gulf and the wide low valley (Mesopotamia) of the Tigris and Euphrates separate Persia and Armenia from the desert plateaus of Arabia and Syria.

236. Palestine, the south-western part of Syria, has some remarkable physical features. It is mainly occupied by a coast range called *Lebanon* in the north and the *Mountains of Judaea* in the south. To the east of this range is a deep,

narrow valley in which the Jordan flows southward into the very salt Dead Sea, which has no outlet, and is surrounded by cliffs, in some places 1000 feet high. Nearly the whole of the Jordan valley is below sea-level, and the surface of the Dead Sea is as much as 1300 feet lower than the Mediterranean (Fig. 51). On the east side of the Jordan valley the land rises very steeply to the edge of the Syrian desert. Opposite Lebanon is a range called *Anti-Lebanon*, containing Mount Hermon.

237. India consists broadly of two parts: (1) the broad plains of the Indus and Ganges, bounded by the great wall of the Himalayas on the north, by the Suliman Mountains on the west, and by the *Aravalli* and *Vindhya Hills* on the south; (2) a triangular plateau called the *Deccan*. The highest part of this is a range along the western edge of it, called the *Western Ghats*. On the other side of the peninsula is the lower and much more broken range of the *Eastern Ghats*. In the extreme south of India are the *Nilgiri Hills* and *Cardamom Mountains*.

The mountainous island of Ceylon is separated from India by the shallow water of Palk Strait, which is, however, nearly closed by a coral reef named "*Adam's Bridge*." There is no channel deep enough for large steamers, which have to go round the south of Ceylon.

Indo-China and Burma have a considerable number of mountain ranges running north and south, separated by long valleys. In the south these valleys open out into extensive deltas, and there is also a considerable area of lowland in Siam, between the Menam and Mekong rivers. The best-known range is the *Arakan Mountains* in Burma, between the Irrawaddy and the Bay of Bengal.

238. Generally speaking, all the islands of the east and south-east of Asia are mountainous and volcanic. In the main island of Japan the cone of *Fusiyama* is 12,000 feet high. Japan has more frequent earthquakes than any other part of the world.

A long range, with many active volcanoes, extends along the whole length of the *Sunda Islands* from Sumatra to Timor. In Java, the centre of this group, there are volcanoes which eject mud instead of lava.

New Guinea is reckoned as an Australian island (Chapter XV.). All the others in the Malay Archipelago are considered in connection with Asia.

RIVERS

1. NORTHERN SLOPE

239. The *Ob* (2,500 miles) rises in the Altai Mountains, as does also its chief tributary the *Irtish*, which receives the *Tobol* from the Ural Mountains. The *Yenisei* (3,000 miles) is parallel to the *Irtish*. It receives a tributary, the Upper *Tunguska* or *Angara*, from Lake *Baikal*, the largest fresh water lake in Asia. Near this lake rises the third great Siberian river, the *Lena* (2,500 miles).

The Siberian rivers are navigable in summer, but as they are frozen for a considerable part of the year, and flow into an ice-bound sea, they are commercially almost useless. The plains round the lower rivers are very desolate, frozen in winter, and becoming in summer vast areas of marsh and flood.

2. INLAND DRAINAGE

240. Turan is drained partly into the Caspian, but more into the Aral Sea, by the rivers *Amu Daria*, and *Sir Daria*, each over 1,000 miles in length. In the Taklamakan depression the chief river is the *Tarim*, flowing into the salt lake of Lob Nor. There are many smaller areas of inland drainage in Afghanistan, Persia, Arabia, and Syria, drained by the rivers *Murghab*, *Helmand* (Fig. 50), *Jordan*, and others.

3. EASTERN SLOPE

241. The *Amur* (2,500 miles) flows from the *Yablonoi* Mountains into the Sea of *Okhotsk*. It forms for a long distance the northern boundary of Manchuria (*Manchukuo*). The river is navigable for over 1,300 miles, and considerable use is made of it.

The *Hwang Ho* (Yellow River) (2,500 miles), sometimes called "China's Sorrow," rises in the *Kwen Lun* Mountains, and flows, after a very sinuous course, into the Gulf of *Chihli*. Its lower course is over the largest area of lowland in China, and the river has often burst its embankments and caused

disastrous floods. At various periods its mouth has been south of the *Shantung* Peninsula, instead of north, as at present.

The upper part of the *Hwang Ho* basin is the great loess region of China. Loess is a light, fertile, yellow soil, supposed to have been blown by wind from the dry central plateaus.

The *Yangtze-kiang* (3,000 miles) is the great highway of central China. It rises in the *Kwen Lun*, and for a long distance its valley is merely a mountain gorge. Then it opens out into the fertile plain of *Szechwan*, where the *Kialing* flows in. Below this plain the river is obstructed by rapids, but the last 1000 miles from *Ichang* to the mouth are navigable. Ocean-going steamers reach *Hankow*. The chief tributary of the lower river is the *Han*. The *Grand Canal* joins the lower *Yangtze* with *Peking*.

The *Sikiang* (900 miles), the chief river of southern China, flows into the estuary called the *Canton River*. It has at its mouth the small but important island of *Hong Kong* (Art. 263).

The Chinese rivers all have their upper courses in deep mountain valleys, and their lower courses across fertile, densely populated plains.

4. INDO-CHINA AND BURMA

242. The deep forested valleys of Indo-China and Burma are drained by five considerable rivers. The largest of these is the *Mekong* (1,600 miles), which rises in *Tibet*, divides *Siam* from *Annam*, and then flows through the low plains of *Cambodia* and *Cochin China*. The other rivers are the *Menam*, into the Gulf of *Siam*, the *Salween* and the *Irrawaddy*, both chiefly in *Burma*.

5. INDIA

243. The *Ganges* (1,500 miles) rises in the *Himalayas* and flows nearly parallel with them in a wide alluvial plain, traversed by many tributaries, of which the *Jumna* and the *Gogra* are the chief. The *Brahmaputra* (called in its upper course the *Sanpo*) flows along the north side of the *Himalayas* in *Tibet*, then flows south and west through an almost impassable gorge into *Assam*, and with the *Ganges* forms a large thickly forested delta called the *Sundarbans*. The most important of the many distributaries of the *Ganges* is the *Hooghly*, because on it stands *Calcutta*, the chief seaport of *India*.

The *Indus* and its largest tributary the *Sutlej* both rise north of the Himalayas in Tibet, and within a short distance of the source of the Brahmaputra. The middle part of the Indus basin is only separated by low hills from the Jumna, and thus the Indus and Ganges basins together form a belt of lowland right across the north of India.

In peninsular India the only important rivers flowing westward are the Narbada and Tapti, north of the Deccan. The eastward-flowing rivers are the Mahanadi, Godavari, Kistna, and Kavari. The last three of these rise in the Western Ghats and thus traverse almost the whole width of the peninsula. None of the rivers of the Deccan is of much use for navigation.

6. SOUTH-WEST ASIA

244. The only large rivers of the south-west of Asia are the *Tigris* (1,100 miles) and the *Euphrates* (1,700 miles), which rise in the Armenian Plateau, and unite in a common delta at the head of the Persian Gulf. These long rivers once fertilised the great plain of Mesopotamia, but the irrigation works which controlled them have been ruined by long neglect, and the plain is now almost uncultivated. The *Tigris* is navigable from Baghdad downwards.

The one great river of Asia Minor is the *Kizil Urmak*, flowing from the Armenian Plateau into the Black Sea.

CLIMATE

245. On account of its vast extent Asia possesses every variety of climate, from equatorial to Arctic. We may distinguish four principal regions: (1) northern, (2) central, (3) south-west, (4) south-east (the monsoon region).

The great Siberian Plain has very great extremes of temperature and a moderate rainfall (10 to 20 inches), increasing from north to south, and occurring (as in Russia) chiefly in the summer. The village of Verkhoyansk, in the Lena basin just beyond the Arctic Circle, has an average January temperature of -60° , and is the coldest inhabited place on the earth, but in July its temperature rises to 60° F.

The central basins and plateaus of Gobi, Taklamakan, and Tibet are extremely dry at all seasons, owing to their great distance from the sea and the wall of lofty mountains almost

completely surrounding them. They are very cold in winter and, owing to their height, cool even in summer.

Most of south-western Asia—Turan, Persia, and Arabia—consists of poor steppes and deserts, with sub-tropical or tropical summers and cool winters. This region is in the "horse latitudes" and trade-wind zone, and therefore, having a great land-mass on the east, has no rain-bearing winds. In Arabia the coast mountains of the extreme south-west and south-east (Yemen and Oman) are the only districts with a fairly heavy rainfall.

Asia Minor and western Syria have a somewhat extreme climate of the Mediterranean type (winter rains) and are the most productive parts of south-western Asia.

246. The special feature of the monsoon countries is their heavy rainfall during the hottest part of the year (Arts. 45, 59). It is this that makes these countries so immensely productive, and accounts for the fact that nearly half the population of the world lives in south-eastern Asia and the adjacent islands.

The influence of the monsoons extends approximately from the Indus valley to Japan, and in all this region there are rainy summers and dry winters. The difference of temperature between winter and summer increases from south-west to north-east (compare the figures for Colombo, Canton, Peking, in the following table, Art. 247). Thus in Ceylon and the Malay Peninsula there are hardly any seasonal differences of temperature, but northern China and Japan have quite cold winters.

Rainfall is extremely heavy on the Western Ghats, the southern slopes of the Himalayas, the Khasi Hills in Assam, and the Arakan Mountains in Burma, all of which face the south-west monsoon.

On the western margin of the monsoon area between the lower Indus and the Aravalli Hills, there is an almost rainless district called the Thar or Indian Desert. This is the only true desert in India, though most of the north-west of the country is comparatively dry.

Ceylon and the extreme south-east of India have two rainy seasons in the year, as the north-east monsoon, in crossing the Bay of Bengal, picks up enough water vapour to produce rain in Ceylon and southern India.

The Malay Archipelago, which is bisected by the equator, is always warm and always wet. There is hardly any seasonal difference in temperature (see figures for Batavia, Art. 247). Though there is no really dry season, the islands north of the equator have their heaviest rain in the northern summer, those south of the equator in the northern winter.

247. The following is a table of average climatic data for various stations in Asia:—

AVERAGE TEMPERATURE: ° F.

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Jerusalem ..	44	48	51	59	66	70	73	73	71	67	56	49
Tashkent ..	30	34	46	57	68	76	80	76	66	54	44	36
Verkhoyansk	-59	-48	-23	8	36	55	60	51	36	5	-34	-52
Peking ..	23	29	41	57	68	76	79	76	68	56	38	27
Canton ..	59	58	64	72	79	83	83	84	82	77	68	61
Calcutta ..	67	71	80	86	86	88	84	83	83	81	73	67
Madras ..	77	78	81	86	90	90	88	86	85	82	79	77
Bombay ..	75	76	79	83	86	84	82	81	81	82	80	77
Colombo ..	79	80	81	83	83	82	81	81	81	80	80	79
Batavia ..	78	78	79	80	80	79	79	79	80	80	79	78

AVERAGE RAINFALL: INCHES

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Jerusalem ..	6.2	4.6	3.5	1.5	.3	—	—	—	—	.4	2.5	5.7
Tashkent ..	2.0	1.2	2.6	2.2	1.3	.5	.2	—	.2	1.1	1.3	1.5
Verkhoyansk	.2	.1	.1	.2	.3	.9	1.1	1.0	.5	.3	.3	.2
Peking ..	.1	.2	.2	.6	1.4	3.0	9.4	6.3	2.6	.6	.3	.1
Canton ..	1.4	3.5	7.0	8.3	10.9	9.9	11.0	9.7	5.7	3.5	1.0	1.0
Calcutta ..	.3	1.1	1.5	1.9	5.7	11.9	12.5	12.7	9.9	4.2	.7	.2
Madras ..	1.4	.3	.2	.5	1.1	1.9	3.9	4.6	5.0	11.7	14.2	5.8
Bombay ..	.1	—	—	.1	.6	19.9	24.3	14.5	10.7	1.7	.5	.1
Colombo ..	3.5	1.9	4.5	7.8	13.0	7.7	6.5	3.0	5.9	13.1	11.0	5.2
Batavia ..	12.5	12.7	8.1	5.4	4.4	3.9	2.8	1.7	3.0	4.6	5.8	7.4

VEGETATION AND ANIMALS

248. In the north of Siberia is a large tundra region, almost uninhabited. This is bordered on the south by a wide belt of sub-Arctic forest, in which a few nomadic tribes

hunt fur-bearing animals. Western Siberia is a region of mixed wood and grass land, which is becoming a great wheat-growing and dairy-farming country.

The rich grass-land of western Siberia passes imperceptibly into the poor steppes and deserts of Turan, inhabited by nomadic tribes with herds and flocks of sheep, cattle, horses, goats, and camels. There are, however, many fertile oases irrigated by rivers—Khiva, Merv, Bukhara, Samarqand, Tashkent—where cotton, wheat, and southern fruits are grown.

Some of these extensive oases were once the seats of wealthy and powerful kingdoms, which fell into decay and were gradually absorbed by Russia. They now form the nominally independent Republic of Turkistan, but for all practical purposes are part of Soviet Russia.

Persia is mostly desert, with some exceedingly fertile irrigated valleys producing wheat, opium, silk, cotton, and roses.

Mesopotamia, the valley of the Tigris and Euphrates, was once the seat of high civilisations (Babylon, Nineveh, etc.), and has been, and ought still to be, very productive, but it has been ruined by bad government and neglect of irrigation works. The country is now called Iraq, and is an independent Arab state.

Arabia is another country of poor grassland, with large areas of sheer desert, some of which are still unexplored. Many of its inhabitants are nomadic. The south-west (Yemen) is fertile and produces coffee, wheat, barley, millet.

Asia Minor, in the fertile valleys and coast plains, produces typical Mediterranean products, raisins, figs, wine, wheat. The interior table-land is only fit for pasture. Mohair wool from the Angora goat is largely exported. Tibet and Mongolia are on the whole very barren. Wool is the principal production. In Chinese Turkistan Kashgar and Yarkand are fertile oases in the Taklamakan Desert, and were once important centres of overland trade to China, before the sea route was discovered. The Trans-Siberian Railway (Art. 266) still further diminished the importance of this old overland route.

The Karakoram Pass, 18,500 feet high (Fig. 50), leading from Leh, in the Indus Valley, to Yarkand, is the highest pass in the world which is actually used as a trade-route.

249. Fig. 52 shows the principal agricultural productions of India. Rice and millet (a grass, the seed of which yields very nutritious flour, though inferior to wheat) are the chief



Fig. 52. VEGETABLE PRODUCTS OF INDIA.
GEORGE PHILIP & SON, LTD.

foods of a large part of the population, and are widely distributed. Rice is grown in wet lowlands, millet in drier upland soil. The chief wheat-growing area is the Punjab, between the Indus and the Sutlej. Of other food-plants tea is the most important. It is grown chiefly on the hills of Assam and of Ceylon.



Hill F. Taylor.

CEYLON: NATIVES HARVESTING RICE.
The work is all done by hand with sickles.

The chief fibre plants of India are cotton and jute. The former is grown most largely in the north of the Deccan, and the latter (used for sacking and other coarse fabrics) is almost confined to Bengal. Southern India produces immense quantities of oil-seeds (chiefly linseed, from the flax plant). India produces more cane-sugar than any other country except Cuba, but while Cuba grows sugar mainly for export, India has to import from Java, the third largest producer. The great forests of the Western Ghats, the Himalayas, and Burma produce valuable timber, especially teak and bamboo. Teak, a very hard, heavy wood, is largely used for the wood-work of ships. Bamboo is a great building material throughout eastern Asia. Rubber, tea, and coconut palm products (oil, fibre, and dried nuts) are the chief exports of Ceylon.

Agriculture in the north-west of India, and in some parts of Southern India, depends very largely on irrigation. The rainfall in these parts is comparatively small, and in winter practically nothing. Large irrigation canals, fed from rivers, have been made in many parts of the Punjab and in the upper Ganges basin. In Southern India large "tanks" to store water for the dry season have been made by damming valleys. In other parts, except the very wettest, water is drawn from wells.

The most important animals in India are humped cattle, which supply milk to a population otherwise generally vegetarian, and are used both for field work and road-transport. India is the home of the Indian elephant, the Bengal tiger, and many poisonous snakes, which cause great loss of life. The elephant has been partially domesticated, and is used for transport, in tiger-hunting, and in state processions.

In Burma and Indo-China the hill forests produce teak and bamboo, and the deltaic lowlands chiefly rice and cotton.

250. Fig. 53 shows the most important productions of China and Japan. The most productive districts in China are: (1) the northern plain, round the lower Hwang Ho, (2) the plain of the lower Yangtze and Han, (3) the "Red Basin" of Szechwan, to the north of the upper Yangtze. The chief productions, which are largely exported from both China and Japan, are silk and tea. Bamboo is a plant of the greatest importance in China, being the chief building material of the country.

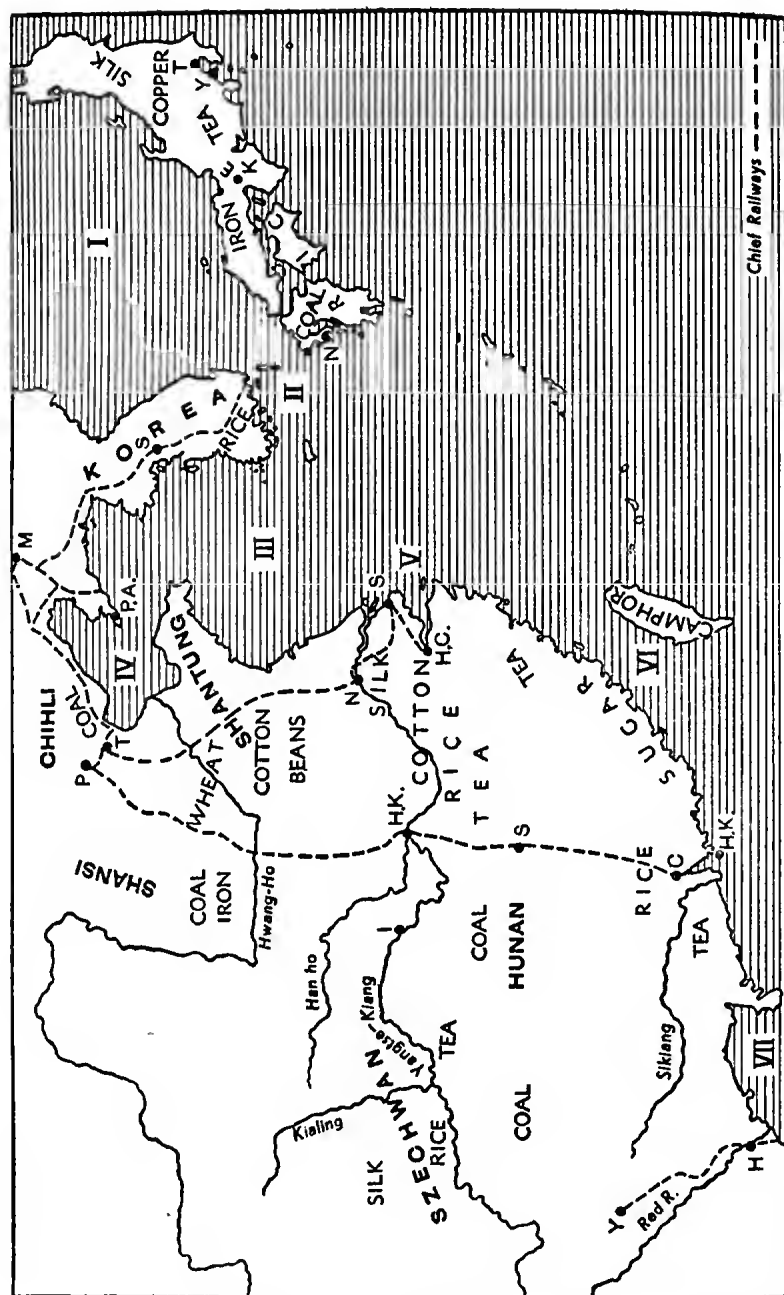


Fig. 53. THE FAR EAST.

The wax tree, the lacquer tree, and the camphor laurel are almost peculiar to Japan. Their products are of importance in various industries. Opium was formerly very largely grown throughout China, but recent legislation has resulted in its production being very largely diminished.

251. The islands of the Malay Archipelago are very fertile, and produce all kinds of tropical plants. Rice, sago, sugar, and tapioca (a starchy food prepared from the root of the manioc) are staple foods. The Moluccas, or Spice Islands, between Celebes and New Guinea, have long been famous for spices, *e.g.* pepper, cinnamon, cloves, nutmegs. Tobacco is largely grown in Borneo, Sumatra, and the Philippines. The last-named islands also produce "Manila hemp."

Malaya, both British and Dutch, including the Malay Peninsula, is now by far the greatest source of the world's rubber, followed by Ceylon. Till about 1910 rubber was mainly got by tapping "wild" trees in the Brazilian forest, but in Malaya and Ceylon the trees are cultivated in regular plantations. Brazilian rubber is now comparatively unimportant.

Java, the best cultivated and most densely inhabited of the Dutch islands, produces much sugar, coffee, tea, and quinine, as well as rubber.

MINERALS

252. Owing to the lack of railways, mining is at present less important in Asia than in any of the other continents, with the possible exception of South America.

Gold is found chiefly in the mountains bordering the Siberian plain on the south, especially in the upper valleys of the Yenisei, Lena, and Amur.

Petroleum is important in Caucasia; the chief centre of its production is Baku, capital of Azerbaijan, on the west side of the Caspian Sea. There are large oil-fields in Southern Persia and in Iraq, near the site of ancient Nineveh. Pipe-lines have been laid to carry the oil of Iraq to the Mediterranean ports of Haifa and Tripoli.

Coal is found chiefly in India and China. In India the chief coal-field is in southern Bengal, to the west of Calcutta, China is known to contain enormous coal-fields (Fig. 53).

probably larger than those of all Europe, but they have hardly begun to be worked, except those in the north near Peking. Many of the Chinese coal-fields also contain iron ores, which will some day be important.

The south of the Malay Peninsula and the islands of Banka and Belitong, between Sumatra and Borneo, furnish most of the world's supply of tin.

Ceylon is one of the chief sources of graphite (plumbago or black lead).

OCCUPATIONS, INDUSTRIES, AND TOWNS

253. Broadly speaking, the productive parts of Asia are almost wholly agricultural or pastoral. The only important manufactures are in India, Japan, and China, and these are on a much smaller scale than European manufactures, while mining, as already mentioned, is at present of comparatively little importance. We shall take first the regions outside the monsoon area and then those within that area.

REGIONS OUTSIDE THE MONSOON AREA

254. In Siberia the chief towns are on the route of the Trans-Siberian Railway (Art. 266), and chiefly, as we should expect, at places where the line crosses the great rivers. Thus we have Omsk on the Irtysh, Tomsk (on a short branch) on the Ob, Krasnoyarsk on the Yenisei, and Irkutsk on the Tunguska, near the southern end of Lake Baikal. The western towns, Omsk and Tomsk, are mainly agricultural centres, exporting wheat and dairy produce to Europe, while Krasnoyarsk and Irkutsk are near important mining districts. Irkutsk is the largest town in Siberia. The Pacific seaport of Russian Asia is Vladivostok (Russian for "Rule the East"). Though it is farther south than Venice, its harbour is frozen for a short period every winter. It is important as the one Pacific port of Russia since she lost Port Arthur (1905), and as the terminus of the Trans-Siberian railway.

The chief towns of Turan and Chinese Turkistan have been already mentioned (Art. 248). The capital of Tibet is Lhasa, sometimes called the "Forbidden City," because foreigners are not allowed to enter the country, which, though nominally under China, is practically ruled by Buddhist monks.

255. Persia is one of the most backward of civilised countries. There are only a few short railways and very few roads; merchandise is mostly carried on pack-animals, generally mules or camels.

The country is famous for carpets and shawls. There are important oil-fields in the west, near the head of the Persian Gulf, exporting crude petroleum, mainly to England. The chief towns are Tehran, the political capital, and Tabriz, the commercial capital, both in the north. Isfahan is the chief commercial centre of the south, and Bushire, on the Persian Gulf, is the chief seaport.

The chief towns in Caucasia are Baku on the Caspian (Art. 252), Batum and Poti, ports on the Black Sea which export much of the petroleum from Baku, and Tiflis, on the Kur, the capital of Georgia, connected by rail with Baku and Batum.

256. In Asia Minor (Anatolia) the chief towns are Smyrna on the west coast, in a fertile district famous for raisins and figs, and Scutari on the Bosphorus, opposite Constantinople. On the Black Sea is Trebizond, the outlet of an important mining district. The capital of Turkey, Angora, is far inland, on the high bleak plateau. The Angora goat produces the fine wool called mohair.

The ports of Syria were in the Middle Ages of much greater importance than they are now, as they lay on the shortest route from Venice and Genoa (then the great commercial powers of the Mediterranean) to Persia and India. Until Vasco da Gama rounded Africa (1497), there was no all-sea route to India, and all commerce to the East involved a land journey. The short sea-route, via the Suez Canal, dates only from 1869.

The chief ports of Syria are Beirut and Tripoli, both connected by rail with Damascus, the centre of a fertile oasis and one of the oldest towns in the world. Haifa, near Acre, is a comparatively new port controlling the easiest entrance to northern Palestine and the Jordan valley. Jaffa, farther south, is important as the nearest port to Jerusalem, which is visited by large numbers of pilgrims. Aleppo, a centre of caravan routes, is the chief town of northern Syria.

The only large town of Iraq (Art. 248) is Baghdad, and this has only a shadow of its ancient splendour, while

Babylon, and Nineveh are deserted ruins. The seaport of the Tigris-Euphrates delta is Basra, which exports chiefly dates. Petroleum is found near Mosul (Art. 252).

The chief towns of Arabia are Mecca and Medina, the sacred cities of Mohammedanism. They are visited annually by many thousands of pilgrims, mostly arriving by way of the Red Sea. Medina is connected with Damascus by rail, and the line is to be continued to Mecca.

In the extreme south of Arabia, Aden is a strongly fortified British naval station and a great coaling port. It is situated in the crater of an extinct volcano, and is in summer one of the hottest towns in the world. It owes its importance chiefly, of course, to the cutting of the Suez Canal. The small island of Perim, in the Strait of Bab-el-Mandeb, is also a coaling-station.

THE MONSOON REGION

257. India has four main outlets to the sea—

Calcutta, on the Hooghly, the western mouth of the Ganges, is the chief commercial city and seaport of India. The river has great tidal bores, and its navigation is dangerous. Calcutta exports the products of all north-eastern India, chiefly tea, rice, jute, oil-seeds, and wheat. The chief manufacture is the weaving of jute.

Bombay is the great cotton port of India, and besides exporting raw cotton has large cotton factories. Though Bombay has a fine natural harbour, it has (unlike Calcutta) no easy routes inland, and did not become of much importance till railways were constructed across the Western Ghats.

Madras, on an artificial harbour, is the chief port of the south-east, and exports rice and oil-seeds.

Karachi, on an artificial harbour to the west of the Indus delta, exports some of the wheat grown in the Punjab, but the export of wheat from India is much smaller than it used to be, since more Indians are using wheat bread as a staple food.

258. The chief inland towns of India are, as one would expect, on the northern plain (compare Italy).

Delhi, on the Jumna, has a very central position on this plain, and was in 1912 made the capital of the Indian Empire, in place of Calcutta. It was the capital of the old Mogul

Empire, which ruled India in the Middle Ages. Agra, lower down the Jumna, is famous for a great marble mausoleum, the Taj Mahal, built by one of the Mogul Emperors. At the junction of the Jumna and Ganges stands Allahabad, an important railway centre, where the Ganges lines connect with a line from Bombay.

On the main river the chief towns besides Allahabad are Cawnpore, a manufacturing town (cotton and metal wares), Benares, a sacred city of Hinduism and a great pilgrimage centre, and Patna, an agricultural centre. Larger than any of these is Lucknow, on the Gumti, capital of the former kingdom of Oudh, and an important military station.

Cawnpore, Lucknow, and Delhi are specially famous in the modern history of India, as they were the scenes of the chief events of the Indian Mutiny of 1857—the massacre at Cawnpore, the siege and relief of Lucknow, and the siege of Delhi.

259. In north-western India the largest towns are Lahore, the capital of the Punjab, Amritsar, which manufactures silk and wool, and Srinagar, famous for its "Cashmere" shawls. It is the capital of the very mountainous country of Kashmir, the northernmost of the states of India. Simla, near the Sutlej, at a height of about 7,000 feet, is the summer residence of the Indian government.

India is bordered on the north-west by the wild, rugged country of Afghanistan, inhabited by savage mountaineers, who have often menaced the less warlike people of the plains. The only easy land routes into India are through the Khyber Pass (Fig. 50) and the Bolan Pass, and these are guarded by the important military stations of Peshawar and Quetta respectively.

The town of Quetta was completely destroyed by earthquake in 1935, but will doubtless be rebuilt, as the military importance of the position is permanent.

260. In Peninsular India the chief towns besides Bombay and Madras are Surat, once an important seaport, but now silted up; Nagpur, the centre of an important cotton-growing district; Hyderabad, capital of the largest state in India; Bangalore, the chief town of Mysore, a gold-mining state; Trichinopoly, the chief centre of southern Madras.

There are numerous other large towns in India, *e.g.* Gwalior, Jaipur, Jodhpur, Ahmadabad, Baroda, often of great magnificence, but important only as the capitals or commercial centres of "feudatory" states, *i.e.* the numerous states in India governed by their own princes, and not directly by the British Government.

The only large town of Ceylon is its capital Colombo, which has been called the "Clapham Junction of the East." It is the most central town in the Indian Ocean, and an important port of call. The ancient capital, Kandy, is in the centre of the island. Trincomalee, on the north-east coast, is a fortified naval station.

261. The great outlet of Burma is Rangoon, on one of the mouths of the Irrawaddy, exporting rice and teak. Farther east is the smaller port of Moulmein, at the mouth of the Salween. The only large inland town is Mandalay, a river-port and the capital of the former kingdom of Burma.

Singapore, an entirely modern town on a small island at the south of the Malay Peninsula, is a "half-way" house between India and China, and a great commercial centre and coaling station, with a tin-smelting industry.

In Indo-China the most important towns are Bangkok, on the Menam, the capital of Siam; Saigon, near the mouth of the Mekong, in Cochin China; and Hanoi, on the Red River, the capital of French Indo-China.

In the Malay Archipelago the chief towns are Batavia, capital of the densely populated island of Java, and of all the Dutch islands in the east; Soerabaya, also in Java; Palembang, in the south of Sumatra; Macassar, in Celebes; and Manila, in the Philippine Islands, famous for tobacco and hemp.

262. In China there are very numerous large towns, of which the population is not known at all accurately. On the northern plain stand Peking, the former capital, and its seaport of Tientsin, from which the Grand Canal runs southward across the Yellow River and the Yangtse to Hang-chau.

Moukden and Harbin are important railway junctions on the Trans-Siberian Railway (Art. 266) in the new state of Manchukuo. At the entrance to the Gulf of Chihli is the

strong fortress of Port Arthur, originally Chinese, then Russian, and now Japanese. In the rocky peninsula of Shantung Britain and Japan have occupied Weihaiwei and Kiaochow respectively as naval stations. The latter place, formerly German, was captured by a combined Japanese and British force in 1914.

263. Shanghai is the great seaport of central China, and is situated just south of the estuary of the Yangtze-kiang. On this river are four great river-ports: Nanking, the present capital of the Chinese Republic, and famous for silk and porcelain; Hankow and Wuchang, with a total population of about two millions, opposite each other at the junction of the Han, in a great tea-growing district at the head of navigation for large ocean-going steamers; and Chungking, the port of the fertile remote province of Szechwan, of which the capital is Chengtu-fu.

The largest town of southern China is Canton, at the mouth of the Sikiang, where several other waterways meet. A considerable number of the inhabitants live in houseboats on the river. Just off the mouth of the Canton River is the small British island of Hong Kong, one of the most important commercial cities of the Far East. Hong Kong and Shanghai together conduct by far the largest part of the foreign trade of China. Besides ocean-going steamers, there are innumerable sailing-vessels ("junks") performing coasting voyages.

264. In Japan the capital Tokyo, is on the east side of the main island (Honshiu). It is on a bay, but for large ships its seaport is Yokohama, a modern town on a good harbour lower down the bay. Farther west are the cotton manufacturing towns of Nagoya, Osaka, Kyoto (the old capital), and the seaport of Kobe. Nagasaki, in the west of the island of Kyushu, is a naval port and shipbuilding town. Hakodate is the port of the northern island of Hokkaido, and has important coal-fields near it.

The large island of Formosa (14,000 square miles) was taken by Japan from China in 1895. Its mountains are covered with forests of camphor laurel, and its plains produce sugar, rice, and tea. The capital is Tainan in the south-west.

In 1910 Japan annexed the Empire of Korea, of which the capital is Seoul, and the chief seaport Chemulpo.

RAILWAYS

265. The only countries in Asia with a fairly complete system of railways are India and Japan.

In India the northern plain has a network of railways in the Ganges valley and the Punjab, extending to the north-west frontier at Peshawar. Lines also run from the Punjab down the Indus valley, with a branch to Quetta. In peninsular India the most important lines are two from Bombay, which have to rise to about 2,000 feet in crossing the Western Ghats. The northern line, after passing the Ghats, divides, one branch going to Allahabad on the Ganges, the other direct to Calcutta through Nagpur. The southern line goes through Poona to Madras.

266. In Asiatic Russia the chief lines are the Trans-Siberian and Central Asian Railways.

The Trans-Siberian Railway (Fig. 54) joins European Russia to the Pacific. The western section is on fairly low ground, but the eastern section is much more difficult, rising to 3,000 feet in the Yablonoi Mountains. At Chita the line bends southward into Manchukuo. At Harbin the line forks, an eastern branch re-entering Russian territory, and reaching the Pacific at Vladivostok, while the southern branch forks again near Mukden, the branches running to Peking, Port Arthur, and through Korea to Fusan.

A very important branch line for Russian political and military influence in Central Asia is called the "Turk-Sib" (Turkestan-Siberian) Railway. It leaves the main line between Omsk and Tomsk, and runs south through Semipalatinsk and then west to join the Central Asian Railway a little north of Tashkent. The Turk-Sib Railway runs not far from the western borders of Outer Mongolia and Sinkiang.

The Central Asian Railway (Fig. 54), built by Russia for military purposes, runs from Samara southward to Tashkent, and then westward, near the borders of Afghanistan and Persia, through Bokhara to Krasnovodsk on the Caspian.

In China the most important line at present open is from Peking through Hankow (Fig. 53) to Siang-tan in Hu-Nan, and Canton. Another line farther east joins Peking to Nanking and Shanghai.

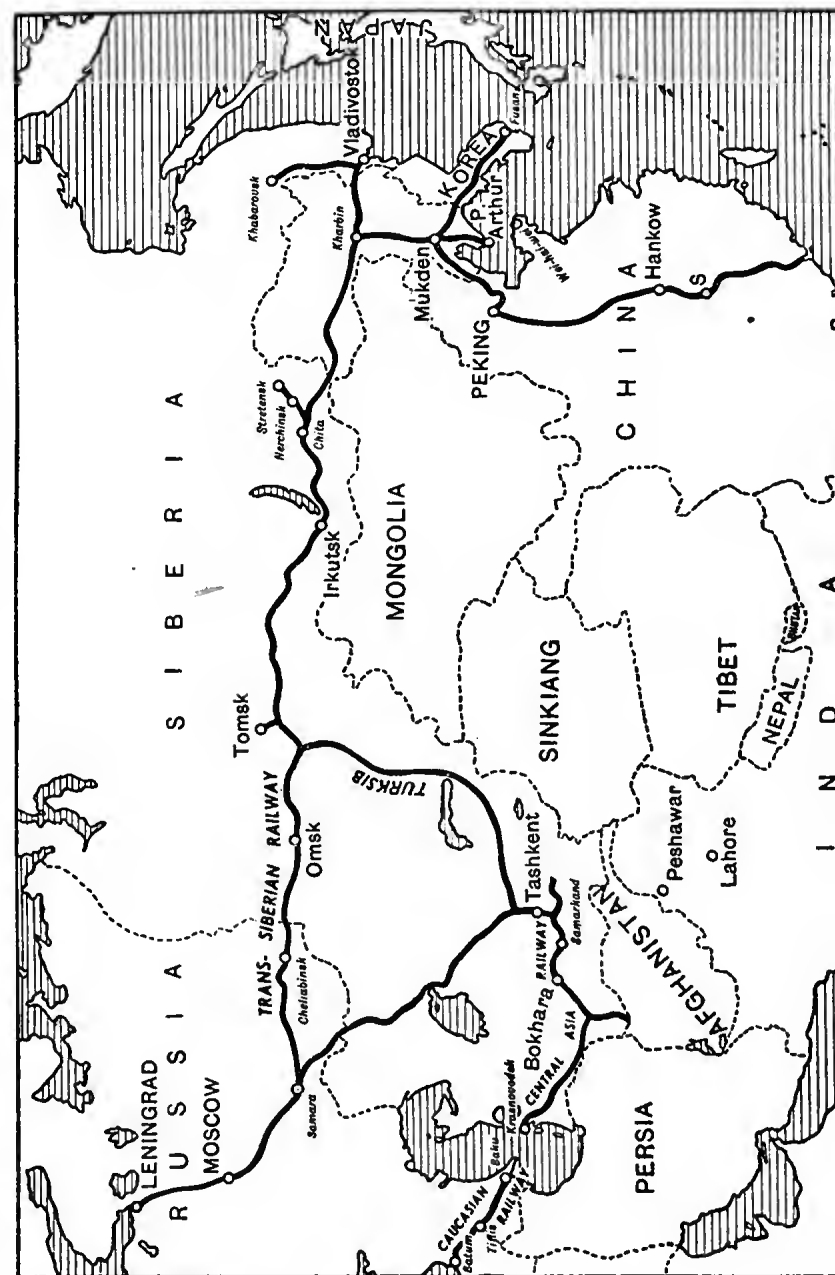


Fig. 54. THE TRANS-SIBERIAN AND CENTRAL ASIAN RAILWAYS.

The **Anatolian Railway** joins Scutari and Smyrna, through Konia, with Aleppo, from which run lines (1) southward through Damascus to Medina, with branches to the coast at Beirut, Haifa, and Jaffa, (2) south-eastward through Mosul and Baghdad to Basra on the mouth of the Tigris. The last line, not yet finished, will, when complete, form a quick passenger route to the Middle East and also to India, via the Persian Gulf.

POLITICAL DIVISIONS AND POPULATION

267. Russian Asia, now part of the "Union of Socialist Soviet Republics," occupies more than one-third of the continent, but has only a small population compared with the countries of the south-east. It is the only part of Asia that is not only governed but colonised by Europeans.

Trans-Caucasia has been split up into three republics, all more or less controlled by Russia: (1) Georgia, round Tiflis and Batum, (2) Azerbaijan, with the great petroleum wells of Baku, (3) Armenia, which contains some former Turkish territory. Its capital is Erivan.

The **Chinese Republic** has a much smaller area than Siberia, but contains more people than any other single country, having a population not known with any great accuracy, but probably nearly equal to that of all Europe. Its former outlying provinces, however, are now either in theory or in fact independent of China proper. They are Tibet, capital Lhasa, governed by Buddhist monks, and scarcely ever entered by foreigners; Chinese Turkistan, now called Sinkiang, capital Kashgar; and the much larger territories of Inner and Outer Mongolia, a land of steppe and desert, mainly inhabited by nomadic herdsmen. There is keen rivalry between Japan and Russia for the future control of Mongolia.

More serious for China than the loss of these remote dependencies was the breaking away of the rich and densely populated province of Manchuria, which has been made into a new state with the name of Manchukuo (capital Hsinking), nominally independent, but practically under the control of Japan until recently.

The **Empire of Japan** (Nippon), after remaining almost completely isolated for many centuries, "woke up" rather

suddenly late in the nineteenth century, and began to adopt European sciences and inventions. At the same time it became an important industrial nation, competing in world-markets with goods of astonishing cheapness (silks, woollens, matches, toys, bicycles, silver-plated ware, and many other products). After a period of empire-building, mainly at the expense of China, her attack on British and United States possessions in the Pacific (1941) led to her final downfall in 1945.

268. Of British possessions in Asia by far the most important is the **Indian Empire**, containing about seven times as many people as the British Isles (see Arts. 382-3). Other British possessions are Ceylon; the Straits Settlements and Federated Malay States in the south of the Malay Peninsula; the north of Borneo and Sarawak; the great island ports of Singapore and Hong Kong; the coaling-stations of Aden and Perim.

French possessions in Asia are, except a few small tracts on the east coast of India (**Pondicherry**), confined to the east side of **Indo-China**, where they include Tongking, Annam, Cambodia, Cochin China, with a total area about equal to that of France.

The **Philippine Islands** were conquered from Spain by the United States in 1898, but in 1935 were declared an independent republic, which, however, will probably need the protection of the States for some time. Nearly all the rest of the Malay Archipelago, except North Borneo, belong to Holland. The Dutch Islands here are known officially as "The Netherlands East Indies." The most important of them, though by no means the largest, is Java. The seat of government is at Batavia.

The **Turkish Empire** formerly contained nearly all south-western Asia, except Persia. It has now been reduced to Asia Minor (Anatolia). Iraq is an independent Arab state, and Palestine has been entrusted by a "mandate" of the League of Nations to Britain to form a "National Home for the Jews." Syria and Lebanon, under French mandate from 1920, became independent republics in 1944.

Arabia, formerly governed by Turkey, revolted during the war of 1914-18. Most of it has since then been conquered by the King of Nejd, the central part of Arabia. He has annexed

the former kingdom of the Hejaz, containing the holy cities of Mecca, the birthplace of Mohammed, and Medina, where he was buried. In the east of Arabia are the two semi-independent sultanates of Kuwait, at the head of the Persian Gulf, and of Oman, capital Muscat, at the entrance of the Gulf. The state of Yemen, in the south-west, is the most fertile part of Arabia, and exports coffee from Hodeida.

269. The greater part of the inhabitants of Asia belong to the Mongolian or yellow race of mankind, which includes the Chinese, Japanese, Koreans, Indo-Chinese, Burmans, Malays, and Turks, as well as the original natives of Siberia, which is now, however, peopled mainly by Russian Slavs.

Most of the many races of India are brown-skinned peoples of the Caucasian or white race; and so are the Arabs, Syrians, Jews, and Persians who, with the Turks, inhabit most of south-western Asia.

The very densely populated parts of Asia are India, especially the north-east; eastern China, Japan, and some of the Malay Islands, especially Java. India, China, Japan, and Java contain together about 800 million people.

ASIA

COUNTRY	AREA Sq. MILES	POPULATION MILLIONS	PRINCIPAL TOWNS POPULATION IN THOUSANDS
Russia in Asia—			
Siberia	4,800,000	11	Sverdlovsk 450,
Steppes and Turkestan	1,500,000	12	Samarquand 130, Vladivostok 200, Tomsk 140, Irkutsk 200, Tashkent 550, Omsk 250
Transcaucasia—			
Azerbaijan	34,000	2	Baku 800
Georgia	26,000	3.5	Tiflis 520
Armenia	15,000	1.2	Erivan 65
Japan (Nippon) ..	149,000	105	Tokyo 6000, Osaka 3000, Kyoto 1000, Yokohama 660, Nagoya 960, Kobe 820, Nagasaki 211
Korea (Chosen) ..	85,000	21	Seoul 400
Formosa	14,000	5	Taipeh 300
Manchukuo	500,000	40	Mukden 850, Dairen 390, Harbin 500, Port Arthur 135, Hsinking 400
China	2,000,000	450	Shanghai 3150, Nan- king 1000, Peiping 1500, Canton 1300, Foochow 1500, Changsha 1300, Ningpo 2000, Soo- chow 1100, Chung- king 900 (Estimates only)
Mongolia	1,360,000	2	Urga
Sinkiang	600,000	3	Kashgar
Tibet	450,000	3	Lhasa 50

ASIA—(continued)

COUNTRY	AREA Sq. Miles	POPULATION MILLIONS	PRINCIPAL TOWNS POPULATION IN THOUSANDS
French Indo-China (Annam, Cambodia, Cochin China, Ton- king, Laos) ..	300,000	20	Hanoi 120, Hué 60, Saigon 110
Siam	200,000	15	Bangkok 700
Straits Settlements and British Malaya ..	51,000	4	Singapore 740
Dutch East Indies (including Dutch New Guinea) ..	736,000	53	Batavia 260, Sura- baya 160
Indian Empire ..	1,581,000	389	Calcutta 2300, Bom- bay 1400, Madras 777, Hyderabad 739, Lucknow 387, Benares 263, Delhi 521, Lahore 672, Cawnpore 487, Amritsar 391
Provinces	865,000	296	Rangoon 400, Manda- lay 148
States	716,000	93	Colombo 280
Burma	262,000	15	
Ceylon	25,000	8	
Afghanistan	250,000	11	Kabul 100, Kandahar 60
Persia	628,000	15	Tehran 400, Tabriz 200
Turkey	290,000	13	Smyrna 150, Angora 75
Syria	50,000	1.5	Damascus 230, Aleppo 250
Lebanon	4000	1.0	Beirut 150
Palestine*	10,000	1	Jerusalem 120
Mesopotamia (Iraq) ..	116,000	3	Baghdad 350
Trans-Jordan*	30,000	0.3	Amman 12
Arabia (Nejd, Hejaz, Yemen, Oman, Kuwait)	1,000,000	6	Mecca 120, Medina

* British mandate.



MADURA: THE GOLDEN LILY TANK AND GOPURAS OF THE GREAT TEMPLE.
 Exclusive News Agency.

QUESTIONS ON CHAPTER XI

1. Name any parts of the monsoon region of Asia which have a heavier rainfall in January than in July, and give reasons for the difference.
2. Which parts of India are the most densely peopled? What are the most important food crops grown in those parts?
3. (i) Give the situation of the following, and any fact of importance concerning each: Hankow, Hong Kong, Irkutsk, Moukden, Osaka, Saigon. (ii) State what are the most important products of Siberia.
4. Name the four great Asiatic rivers indicated as follows:—(i) the western river of the Siberian plain, (ii) the great highway of Central China, (iii) the twin rivers of Mesopotamia.
Describe briefly the nature of the country traversed by each—as mountain or plain; forest, grassland, or desert.
Are all these rivers navigable? Are there any natural hindrances to navigation which affect the usefulness of any or all of them?
5. Draw a sketch-map of the coast from Cape Comorin to Singapore, with the island of Ceylon and the Andamans. Mark Adam's Bridge, the mountains of Arakan, the Carnatic, Colombo, the Coromandel and Orissa Coasts, Malacca and the Straits, the deltas of the Mahanadi and Irrawadi, Rangoon, Singapore, the Sundarbans.
6. Describe the position, relief, and climate of Japan, accounting as fully as you can for its climate. Compare the British Islands with Japan in these respects.
7. State (i) why Bombay derived greater advantage from the making of the Suez Canal than Calcutta; and (ii) from what parts of Asia large supplies of cotton, silk, rice, tobacco, and tin are exported to Great Britain and other European countries.
8. Name the arms of the sea marked in Roman numerals in Fig. 53.
9. Name the towns marked by initials in Figs. 52 and 53.
10. Give an account of the productions of (a) Asia Minor, (b) the plain of the Yang-tse-Kiang.
11. Describe the physical features of one of the following: Central China, Ceylon, Indo-China. Illustrate by a sketch-map.
12. Account for the importance of the position of three of the following: Aden, Baghdad, Colombo, Karachi, Omsk, Smyrna.
13. Which parts of India lack sufficient rainfall? Where and how is this difficulty overcome, and what crops are raised in these areas?
14. In Asia we find the place with the coldest winter, and the wettest place on earth. Locate these two places and explain why the one is so cold and the other so wet.

CHAPTER XII

AFRICA

GENERAL

270. Africa is about two-thirds as large as Asia, or three times as large as Europe. It contains a greater area of land between the tropics than any other continent.

The extreme length of the continent, from Cape Bon in Tunis to Cape Agulhas in Cape Colony, is about 5,000 miles. The extreme width, from Cape Verde in Senegal to Cape Guardafui in Somaliland, is about 4,500 miles.

Africa is often called "the Dark Continent," because until the second half of the nineteenth century very little was known about the interior, especially in Equatorial Africa. Thus, *e.g.* the sources of the Nile, the Equatorial lakes, the highest mountains in the continent, and the upper courses of the Congo and the Zambesi, were all unknown about 1850.

There are now, however, very few districts which have not been traversed by Europeans, but a great amount of detailed exploration and surveying remains to be done.

Commercially, Africa is still the least important of the continents.

COASTS

271. Africa has less coast-line in proportion to its area than any other continent. There are no very deep indentations and no very long peninsulas. In the north is a large bay, of which the eastern half is called the Gulf of Sidra and the western half the Gulf of Gabes. The Gulf of Guinea separates the broad southern and western limbs of Africa, and divides at its head into two wide bays or bights, the Bight of Benin and the Bight of Biafra, with the Niger delta between them.

The continental shelf of Africa is almost everywhere narrow, the continent rising steeply from deep water. The coast is generally low, and in equatorial Africa vegetation generally descends to the water's edge, in very unhealthy mangrove swamps. There are very few good natural harbours in the whole continent.

LAND RELIEF

272. Africa may be broadly divided into three parts, which are bounded with sufficient accuracy by the two following lines: (1) from the Canary Isles to the head of the Gulf of Gabes (roughly along the southern boundaries of Morocco, Algeria, and Tunis); (2) from Loanda, in Portuguese West Africa, eastward to the junction of the Lukuga with the Congo, and then N.N.E. to Suakin on the Red Sea.

273. The three regions thus partitioned are—

(i) In the extreme north is a very mountainous limestone region filling nearly all the three northernmost states of Africa. In the west are the *Atlas* mountains, rising to over 14,000 feet, and in the east the lower *Aures* mountains, which are really part of the Atlas system. Between the main ranges and the sea is a strip of undulating fertile land called the *Tell*. In the south of Algeria and Tunis there is a depression, part of which is below sea-level. This region contains numerous shallow salt lakes (without outlet) called *shotts*.

(ii) Most of the rest of North Africa, southward to the Congo and eastward to the Nile, consists of a low plateau, generally from 500 to 1,500 feet high. A long ridge of higher ground, the *Tibesti* mountains, runs diagonally across this from north-west to south-east. There is also a broken belt of highland from the source of the Niger (the *Futa Jallon* Plateau), parallel to the coast but at some distance from it, to beyond the mouth of the Congo, where it connects with the South African plateau.

At the head of the Bight of Biafra, close to the sea, is an extinct volcano, Cameroon Peak, about 13,000 feet high.

(iii) Nearly all South Africa and east Central Africa, as far as the north of Abyssinia, is occupied by a high plateau (mostly from 2,000 to 5,000 feet). In the north-east of this region is the greatest mass of high ground in Africa, the Plateau of Abyssinia, with many extinct volcanoes, some of which rise to 15,000 feet.

274. Eastern Equatorial Africa (Fig. 55) is the great lake region of the continent. The lakes here are of two kinds: (i) long narrow lakes lying in flat-bottomed steep-sided valleys—Nyasa, Tanganyika, Edward, Albert, Rudolf;

(ii) broad round lakes at a higher level, occupying shallow depressions in the plateau—Victoria (the largest lake in Africa, as large as Ireland) and Lake Tana in Abyssinia, the source of the Blue Nile.

The lake plateau contains the highest mountains in Africa—Ruwenzori, about 19,000 feet, between Lakes Albert and Edward, and Mounts Kenya and Kilimanjaro, each about 17,000 feet, to the east of Lake Victoria. Ruwenzori and Kenya are on or close to the equator. Kirunga is an active volcano near Lake Edward.

The Congo Basin, to the west of the lake plateau, is a large flat, nearly circular plain, mostly over 600 feet high, but almost completely encircled by higher ground (Fig. 55). It is the floor of an old inland sea.

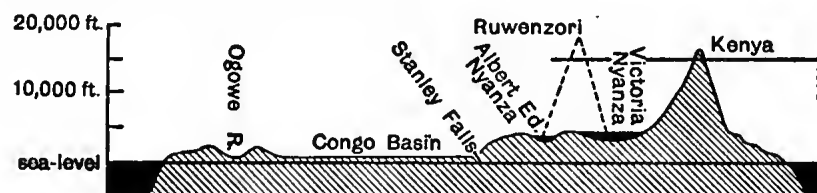


Fig. 55. SECTION ACROSS CENTRAL AFRICA.

275. The chief elevation in South Africa is the Drakensberg (= Dragon Mountains), over 10,000 feet high, in Basutoland, Natal, and the Transvaal. Farther north the Lebombo Mountains form the eastern boundary of the Transvaal. In South Africa as a whole, from about 10° S. to Cape Agulhas, there is hardly any land below 2,000 feet, except narrow coast plains, and a large proportion is over 4,000 feet.

Cape Colony rises from the southern ocean in a series of nearly flat terraces: first the narrow coast plain, then the Little Karroo, then at a higher level the Great Karroo, about twice as wide, rising by the Nieuwveld Range to the High Veldt, which fills all the interior of South Africa.

The fact that so much of Africa, and especially the south, consists of plateaus with steep seaward slopes produces the result that while some African rivers do not reach the sea, those that do so have their lower courses much interrupted by falls or rapids, so that they are of little use for navigation. It is true that long stretches of the middle Congo and the middle Niger are navigable, but these navigable reaches are cut off by falls from the ports at the mouths of the rivers.

RIVERS

1. MEDITERRANEAN

276. The only important African river flowing northwards is the *Nile* (Fig. 56), one of the longest rivers in the world (about 4,000 miles), extending through about 35° of latitude. It flows from Lake Victoria over the Ripon and Murchison Falls to the north end of Lake Albert, which receives the Semliki River from Lake Edward. The combined outflow of all three lakes, called the *White Nile*, flows northwards over a wide marshy plain, receiving about 10° N. the only important left-bank tributary, the Bahr-el-Ghazal, and also the Sobat on the right.

At Khartoum the Nile receives its chief tributary, the *Blue Nile*, from Lake Tana in Abyssinia. This is a large very muddy river in summer and autumn (during the rainy season in Abyssinia), but becomes comparatively small in winter and spring; while the *White Nile*, on the other hand, does not vary very greatly, as it comes from the equatorial belt, where there is rain at almost all seasons.

The only permanent tributary below Khartoum is the Atbara (or Black Nile), also from Abyssinia, and, like the *Blue Nile*, a large river in summer, but a very small one in winter.

Between Khartoum and Aswan the navigation of the Nile is impeded by six "cataracts" or rapids (numbered 1 to 6 in Fig. 56). They can be navigated by steamers of light draught when the river is in flood.

Owing to evaporation and the use of water for irrigating the land, the Nile at Cairo is considerably smaller than it is at the junction of the Atbara. Below Cairo is the triangular delta, extending from Port Said on the east to Alexandria on the west. The delta is traversed by numerous irrigation canals, and when the Nile is low none of its water reaches the sea.

277. The *Nile Flood* is chiefly due to the great changes in volume of the *Blue Nile* and the Atbara. The flood is very important, because Egypt is an almost rainless country, and without the Nile it would be a desert, whereas it is in fact the most productive and most densely populated part of Africa.

The Nile is at its lowest in May and June. It begins to rise early in July, and reaches its greatest height at Aswan early in September, but at Cairo not till the beginning of October. The average rise of the water in lower Egypt is about 24 feet.

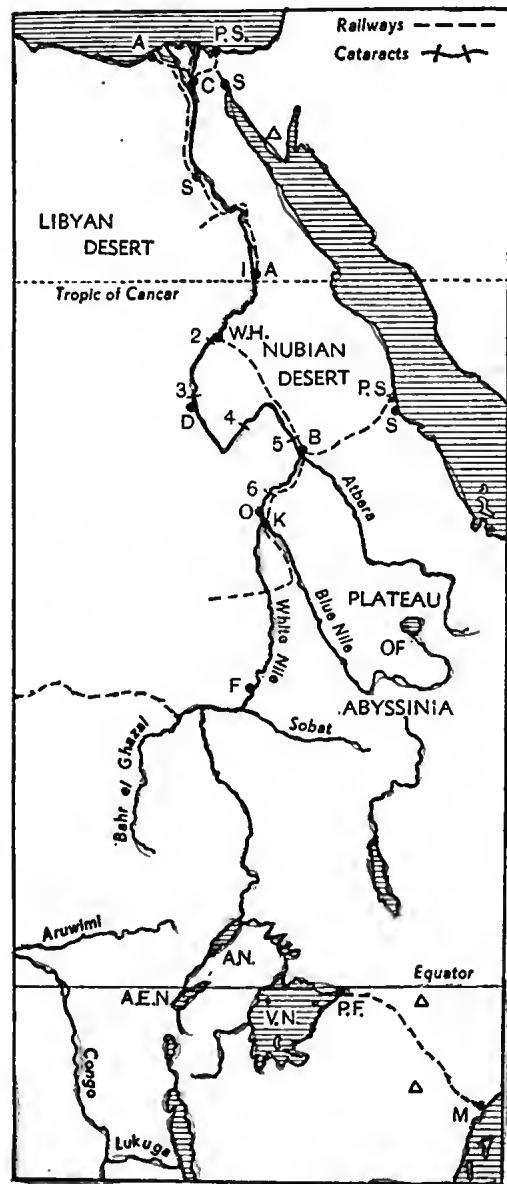


Fig. 56. THE NILE.

The flood is made use of for irrigation in two ways: (1) *basin* irrigation, by actual flooding of the low-lying land near the river. The water, after standing in the "basins" for about six weeks, and depositing much fertile mud in them, is drained back into the river when it begins to fall. This is the general method in "Upper Egypt," above Asyut. (2) *Perennial* irrigation: water is led off from the river through sluices into canals, which communicate with a network of ditches in every field. This enables crops to be grown during the flood as well as after it, and is the general method in Lower Egypt.

To regulate the Nile and enable its flood waters to be used for a longer period, a great dam has been built at Aswan, which has

considerably raised the level of the upper river for many miles above the dam. There are similar regulating works at Asyut and at the "Barrage" just below Cairo. Owing to these dams the area of productive land in Egypt has been considerably increased, and the water supply made more certain and regular. Irrigation is of great antiquity in Egypt, but has been enormously improved in modern times, and especially during the British occupation, which lasted from about 1882 to 1922. More recently a great dam has been built across the Blue Nile at Sennar, in the Anglo-Egyptian Sudan. The Sennar Dam enables a large area of cotton plantations to be irrigated.

2. WEST AFRICA

278. The great river of West Africa is the *Niger* (2,300 miles), which rises in the Futa Jallon Plateau, on the border of Sierra Leone, and makes a roughly semicircular course into the Gulf of Guinea. The large swampy delta is so densely forested, and the river enters the sea through such a multitude of small interlacing creeks, that a considerable amount was known about the upper Niger before the mouth was discovered.

The river is navigable by small steamers for about 400 miles from the mouth, but between about 10° N. and 16° N. there are numerous rapids. The upper Niger, however, is again navigable by large canoes manned by forty or fifty men. The chief tributary is the *Benue*, which rises in the highlands south of Lake Chad. The middle part of the Niger basin is probably the most densely populated part of tropical Africa.

The *Senegal* and *Gambia* flow westward from Futa Jallon into the Atlantic, respectively north and south of Cape Verde. The *Volta* is the chief river of the Gold Coast.

3. CENTRAL AFRICA

279. The *Congo* (3,000 miles) is the largest and the second longest of African rivers. It rises in the south of the lake plateau and flows northwards to the equator through Lakes Bangweulu and Moero, receiving on the right the Lukuga river from Lake Tanganyika.

Just north of the equator are the Stanley Falls, where the river leaves the high eastern plateau and enters its lower basin. From these falls to Stanley Pool there is uninterrupted

navigation for about 1,000 miles, but the river then breaks through a deep gorge in the western highlands, and is interrupted by many rapids and falls. The Congo has very numerous tributaries, most of which have falls or rapids where they leave the highlands for the flat middle basin of the river. The chief tributaries are the Ubangi and Aruwimi on the north and the Kasai on the south. The Congo basin is for the most part so densely forested that its exploration is very difficult, but the southern higher part of the basin (Katanga) is open "park-land" or savanna.

4. SOUTH AFRICA

280. The largest river of South Africa is the *Zambesi* (1,800 miles), the only great African river flowing into the Indian Ocean. Its course is very much broken by falls and rapids, and it is of less importance as a route than any of the other rivers named above. Near the middle of its course the river, here 1,000 yards wide, plunges over the Victoria Falls, the greatest waterfall in the world, into a narrow, almost inaccessible, gorge 400 feet deep. The chief tributary of the Zambesi is the Shire, flowing into the delta from Lake Nyasa.

The *Limpopo* or Crocodile River is the only other considerable river that flows into the Indian Ocean. It forms for a long distance the northern boundary of the Transvaal.

The *Orange* River rises in the Basuto Highlands at Mont aux Sources, one of the principal peaks of the Drakensberg. It forms, except in the middle of its course, the northern boundary of Cape Colony. The river varies greatly in volume with the seasons, but is never navigable. Its chief tributary, the Vaal, separates the Orange Free State from the Transvaal.

5. INLAND DRAINAGE

281. There are three considerable areas in Africa which have no outlet to the sea. One is around *Lake Chad*, on the southern edge of the Sahara. The lake is a shallow salt-water basin of very variable size. The river Shari flows into it from the south-east. The Kalahari Desert in Bechuanaland is another region of inland drainage with *Lake Ngami* as its centre. Thirdly, part of the Abyssinian Plateau drains southward into *Lake Rudolf*.

CLIMATE

282. The extreme north of Africa (north of the Atlas) and the extreme south-west (a small district round Cape Town) both have climates of the Mediterranean type, *i.e.* with mild, fairly rainy winters, and hot, dry summers. Of course, when it is winter in Algeria it is summer in Cape Town, and vice versa.

Apart from the Atlas region, the whole of north Africa is very dry at all seasons, about as far south as a line joining Timbaktu on the Niger with Berber on the Nile. This Sahara region is intensely hot in summer and in winter is as warm as an English summer. The Sahara is in the belt of north-east trade-winds, which in most parts of the world are rain-bearing, but in this case they blow towards Africa over the deserts of south-western Asia, and are therefore extremely dry.

283. Central Africa* is mostly in the belt of heavy tropical rain, but the eastern "horn" (Somaliland) is always dry, for the same reason as the Sahara is. Moreover, the rain-belt moves north and south with the sun. In the *northern summer* the belt of very heavy rain is along the coast of the Gulf of Guinea, and from its head across the continent to the Abyssinian Plateau. At this season the whole continent from the equator to about 16° N. is well watered, while all South Africa is very dry except the Cape Town district.

In the *northern winter* the rain-belt has moved mostly south of the equator. The region of heaviest rain is now round the sources of the Congo and Lake Nyasa. From about 15° S. to the southern extremity the east side of the continent has abundant rain, while the west side is very dry. This part of Africa is in the belt of south-east trade winds, and it follows therefore that rain falls chiefly on the east side, especially as this side is mountainous (Drakensberg and Lebombo Mountains).

The hottest part of Africa, with average temperatures of 90° or more, is naturally at this season (the southern summer)

* This and the following section cannot be properly followed without reference to rainfall maps, which should be contained in the student's atlas.

south of the equator, and extends from about the Orange River to Lake Tanganyika. The west coast of South Africa is distinctly cooler than the east coast, owing to the influence of the Benguella Current (Art. 66).

284. The equatorial belt—roughly the middle part of the Congo Basin and the lake-sources of the Nile—has no really dry season, but two very wet seasons, about March and September, when the belt of heavy rain crosses the equator, and between them two somewhat drier seasons, about December and June.

The following table gives climatic data for a number of African stations, all near sea-level, except Khartoum (1,300 feet), and Nairobi (6,000 feet).

AVERAGE TEMPERATURE: ° F.

DISTRICT	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Cairo ..	54	57	61	69	77	80	82	82	78	74	65	57
Khartoum	70	73	79	86	91	91	88	86	88	87	80	72
Mombasa	81	81	82	81	79	77	76	76	78	79	80	81
Nairobi ..	64	65	66	66	64	61	60	61	63	66	64	63
Freetown	82	83	83	83	83	81	79	78	79	80	81	82
Libreville	80	80	81	81	80	77	75	76	77	78	78	79
Walfish												
Bay	65	66	66	65	62	60	59	57	58	60	61	64
Cape Town	70	70	68	63	59	56	55	56	58	61	64	68

AVERAGE RAINFALL: INCHES

DISTRICT	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Cairo ..	.4	.2	.2	.2	.1	—	—	—	—	—	.1	.2
Khartoum	—	—	—	—	.1	.3	1.6	2.2	.7	.2	—	—
Mombasa	.8	.9	2.3	8.1	13.8	3.7	3.6	2.1	2.2	3.7	5.2	2.3
Nairobi ..	1.8	1.6	4.0	8.5	5.0	1.3	.7	1.2	.8	2.3	6.4	2.7
Freetown	.5	.4	1.2	5.1	13.5	22.8	37.9	40.1	30.3	14.3	5.4	1.1
Libreville	9.8	9.3	13.2	13.5	9.6	.5	.1	.7	4.1	13.6	14.7	9.8
Walfish												
Bay	—	—	—	.2	—	—	—	—	.1	—	—	—
Cape Town	.7	.6	.9	1.9	3.8	4.5	3.7	3.4	2.3	1.6	1.1	.8

VEGETATION AND ANIMALS

285. North of the Atlas Mountains the country is in many respects more European than African, and closely resembles the south of Spain. The Tell (Fig. 58) has forests of oak and other trees of the temperate zone, and produces olives and wine, wheat, barley, and maize, while pastoral occupations are also important.

The Sahara Desert has both to the north and south of it a belt of poor steppes. The northern one produces considerable quantities of alfa or esparto grass, which is used in paper-making. The desert itself is to a large extent a bare waste of sand and rock, with sand-dunes, which sometimes attain a height of 600 feet. Scattered over the desert, however, there are numerous oases, fertile tracts where underground water comes near the surface, or alongside short rivers which end in the sand. The chief oases are those of Tafillet and Tuat, south of Morocco, and Ghadames and Murzuq in Tripoli (Fig. 58).

The oases grow all kinds of tropical food plants (except those that demand a wet climate) and cotton, but their chief product is dates, the fruit of the date-palm. They are important centres for the numerous caravans which cross the Sahara by well-defined routes, carrying southward manufactured articles from Europe and bringing back ostrich-feathers, ivory, skins, etc.

In Egypt, owing to the Nile Flood (Art. 277), agriculture is more important than in any other part of Africa. The area of Egypt is 400,000 square miles, but the cultivated part of the country is only about one-thirtieth of this, and all of it lies near the river, the rest of the country being desert. The chief crop in lower Egypt is cotton, and in upper Egypt sugar, but rice, maize, and wheat are also grown. Wheat is often grown in winter on the same land which in summer grows rice, cotton, or some other tropical plant.

286. A large proportion of Central Africa consists of open park-like forest and grassland (*savanna*). Dense tropical jungle occurs in the regions of most constant rain, *i.e.* (i) in the Congo basin, extending to the west of the upper Nile, (ii) along the lower Niger and the Guinea coast about as far as the mouth of the Gambia river, (iii) on the east coast from the equator to beyond the mouth of the Zambesi.

The savanna region is mainly pastoral, but in some parts, especially Northern Nigeria, cotton and maize are grown. The chief products of the tropical forest are palm-oil and rubber, the last especially in the Congo Basin (Fig. 57). The Gold Coast grows much cocoa.

In South Africa (south of the Zambesi) we find (Fig. 57) (a) an eastern region of good pasture, from the upper Orange to the lower Zambesi—the chief cattle-raising part of Africa, with some agriculture (maize, sugar, and tea) in Natal. (b) A southern region chiefly of sheep-pasture—one of the greatest wool-producing regions of the world, after Australia and Argentina. It also exports ostrich-feathers and, from the south-west corner, wine. (c) A western region of poor steppes and deserts, with no productions of any importance, except some copper and diamonds in the south-west.

287. Africa is the home of many large wild animals, including the lion, elephant, giraffe, zebra, hippopotamus, rhinoceros, crocodile, and many kinds of apes and antelopes. Ostriches are important for the commercial value of their feathers, and in South Africa are kept in captivity, like poultry. In the northern steppes and deserts the camel is an important beast of burden, and in South Africa the ox is the usual draught-animal. In Central Africa merchandise was till very recently always carried by human porters, as the tsetse fly makes large areas uninhabitable by horses or oxen. The extension of railways and motor roads is helping to do away with this very expensive method of transport.

MINERALS

288. South Africa contains the richest gold-field in the world, situated in the south of the Transvaal, on a ridge of hills called Witwatersrand, or simply the "Rand," near Johannesburg. The Rand produces annually gold worth over £100,000,000, about half of the total gold production of the world. There are other gold-fields in the east of the Transvaal, round Barberton, and in southern Rhodesia. Small quantities of gold are also exported from the Gold Coast Colony in Guinea (guineas were so called because they were first coined with gold from Guinea). A promising new gold-field is being developed in Kenya, east of Lake Victoria.

A small area round Kimberley, in Griqualand West, between the Orange and Vaal rivers, is rich in diamonds, which are also found in "South-West Africa."

The most important coal-fields in Africa, so far as is known, are also in the south, in northern Natal (Newcastle), the south



Fig. 57. CENTRAL AND SOUTH AFRICA.
Chief Products (excluding Minerals).

of the Transvaal, and the Wankie coal-field in Rhodesia. Iron ore is found in the Transvaal and in Algeria. Tunisia exports phosphates.

Copper ore is found at Ookiep, in the north-west of Cape Colony, and on a much larger scale in the Katanga district in the south of Belgian Congo, and the adjoining part of Northern Rhodesia. Nigeria exports some tin.

OCCUPATIONS, INDUSTRIES, AND TOWNS

289. There are no important manufactures in Africa, as a large part of the continent is still quite uncivilised, and those parts that are commercially important are engaged in the production of food, raw materials, or minerals. The most important products of the various regions have been already mentioned, and it only remains to indicate the most important towns, nearly all of which, except Cairo and a few South African towns, are seaports.

EGYPT

290. Cairo, at the head of the Nile delta, is the capital of Egypt, the only part of the continent with an ancient civilisation and a dense population; it is the largest town in Africa, and a fashionable winter resort for Europeans. The great seaport and commercial centre of Egypt is Alexandria, which has been for many centuries the chief port of the eastern Mediterranean. It lies to the west of the delta, on a sand-bar between the sea and a large lagoon. Rosetta and Damietta are minor ports at the mouths of the chief branches of the Nile, and Port Said is an important coaling-station at the north end of the Suez Canal.

Aswan and Asyut (Siut) in upper Egypt have been already mentioned (Art. 277). Halfa is the frontier town between Egypt and the Anglo-Egyptian Sudan. It was of military importance from about 1885 to 1898, when the Egyptian Sudan was in the hands of hostile natives. Berber is at the junction of the Nile Railway with the important branch leading to Port Sudan on the Red Sea, near Suakin. Khartoum, in the angle between the Blue and the White Nile, is the natural centre and capital of the Anglo-Egyptian Sudan. On the other side of the river is the large native town of Omdurman.

NORTH AFRICA

291. Tripoli (Fig. 58) is the terminus of the caravan routes from the Sahara, through Ghadames and Murzuq, and exports dates, ivory, ostrich-feathers, and esparto grass. Benghazi, further east, is a smaller port of the same character. Tunis, Algiers, and Oran, the chief towns of French North Africa, export cork, wine, olives, dates, esparto grass, together with iron and other ores and phosphates. Tunis is near the ruins of Carthage. A few miles from it is the natural harbour of Bizerta, which the French have made into a naval fortress.

Morocco has been till recently one of the most backward states in the world, owing to the fierce hostility of its natives (Moors) to foreigners. Since the French occupation it is becoming more peaceful and developing its resources, which are similar to those of Algeria. Its chief ports are Casablanca

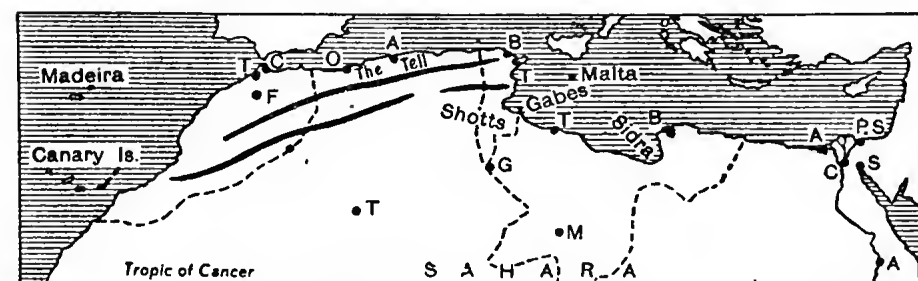


Fig. 58. NORTH AFRICA.

and Tangier. The latter of these is governed by an international commission. Ceuta is a Spanish fortress opposite Gibraltar.

The chief oases of the Sahara have been mentioned in Art. 285.

FRENCH SUDAN, GUINEA, AND NIGERIA

292. Timbuktu, near the great northern bend of the Niger, is in the steppe land on the southern edge of the Sahara, and is a point where caravan routes converge from the desert. The only other considerable inland towns in this part of Africa are in the British colonies of Nigeria. The Hausas and Yorubas of the lower Niger basin are the most civilised of the natives of West Africa. In Northern Nigeria the chief native towns are Kano, Sokoto, and Gando, in

Hausaland, and Lokoja, at the confluence of the Benue and the Niger; in Southern Nigeria Abeokuta and Ibadan, in the Yoruba country.

A large number of ports, mostly small, very unhealthy, and with bad harbours, lie on the West African coast from St. Louis, at the mouth of the Senegal, to Calabar, on the Cross River, east of the Niger delta. The most important are Freetown, capital of Sierra Leone, possessing the best harbour in West Africa, and Lagos, capital of Nigeria, built, like Alexandria, on a bar between the sea and a large lagoon. Other ports are Dakar, near Cape Verde, Bathurst at the mouth of the Gambia, Monrovia in Liberia, Takoradi, Cape Coast and Accra on the Gold Coast, Akasa and Bonny in the Niger Delta.

West Africa exports principally palm-oil, cocoa, rubber, kola-nuts, ivory, and various tropical woods, with a small amount of cotton. It imports manufactured cotton, hardware, spirits, and firearms.

There is an extraordinary system of inland creeks along the Guinea Coast, so that it is possible for a native canoe to go from Calabar to the Gold Coast without putting to sea.

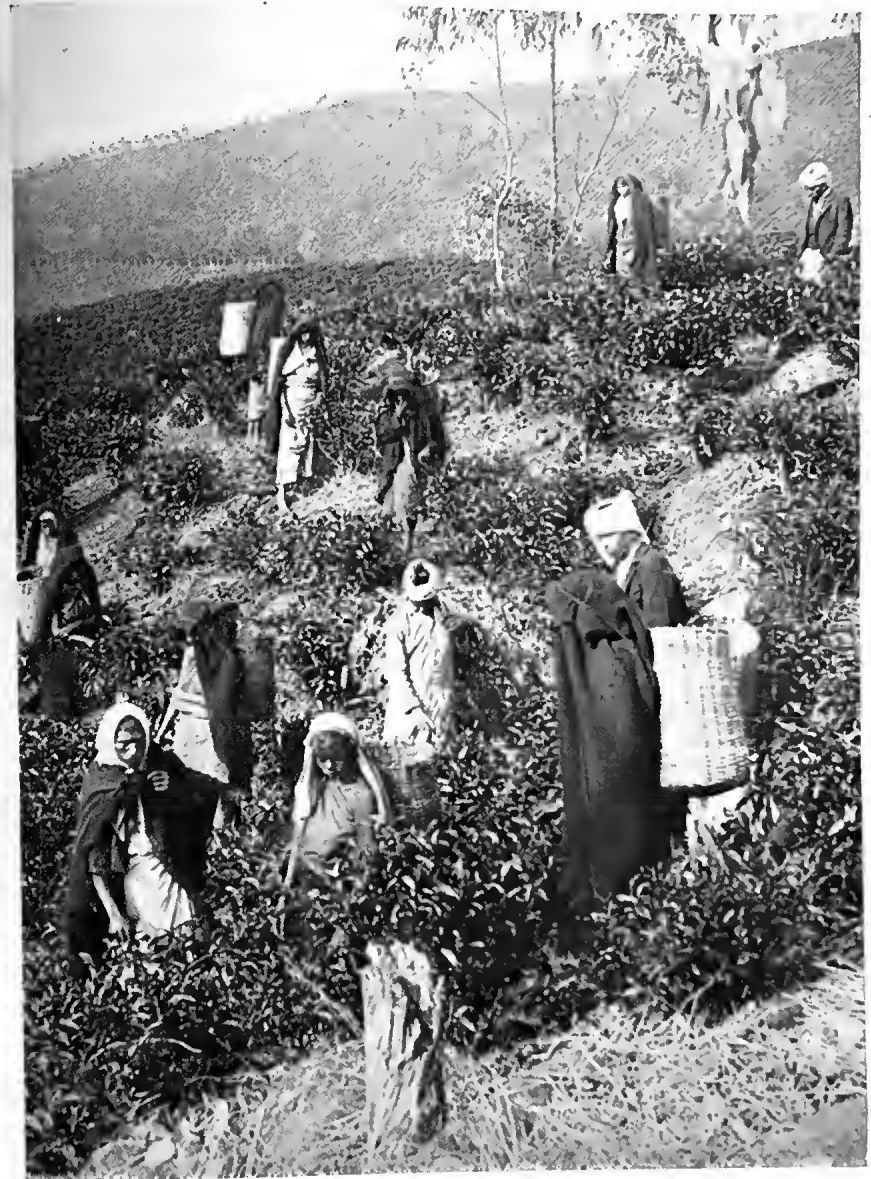
CENTRAL AFRICA

293. The most important part, commercially, of Central Africa, is the Belgian Congo, on account of its large export of palm-oil, ivory, and other tropical forest products. The ports near the mouth are Boma, the seat of government, and Matadi, at the head of the navigable part of the lower river, from which a railway runs to Leopoldville on Stanley Pool, the chief river-port and inland trading-station, at the foot of 1000 miles of river traffic.

French Congo, farther north, is an undeveloped country of much the same character. The forests of the Ogowe river are the chief home of the gorilla, the largest ape.

Angola, or Portuguese West Africa, exports palm-oil, rubber, and coffee, through Loanda and Benguella.

In East Central Africa, which is commercially less important than the Congo basin, the chief seaports are Mombasa, in Kenya Colony, Dar-es-Salaam, in Tanganyika Territory, and Zanzibar. The last is a small island thirty miles from the coast, and, like the neighbouring island of Pemba, produces



Will F. Taylor.

CEYLON: PICKING TEA IN THE NAMOYA VALLEY.

The tea leaves are dried and "cured" after picking, before being sold.

large quantities of cloves and coco-nuts. Zanzibar was formerly the chief trading-station of all East Central Africa, but its importance has been diminished by the creation of new ports on the mainland, with railways running inland. The highlands of Kenya, in the interior, have a considerable number of English settlers, employing native labour on their coffee and sisal plantations. The chief town is Nairobi.

Abyssinia (Ethiopia) is an inaccessible country, which has preserved from very early times a primitive form of Christianity. The capital has been frequently changed. The present capital is Addis Ababa and the chief trade centre Harar. The country has no seaboard, but access to it is provided by the ports of Massawa on the Red Sea and Jibuti and Berbera on the Gulf of Aden. They are respectively in Italian, French, and British territory. The only railway is from Jibuti to Addis Ababa. Abyssinia was conquered by Italy in 1935-36, but with the help of British arms regained its independence in 1941.

SOUTH AFRICA

294. Cape Town, the largest seaport of South Africa, is situated on Table Bay, overlooked by the flat-topped Table Mountain. It was the first European settlement in South Africa, and has long been important as a port of call for ships bound for Australia or India, though its importance in this respect was somewhat diminished by the opening of the Suez Canal. It exports chiefly gold, diamonds, fruit, and ostrich feathers.

The eastern ports of Cape Colony, Port Elizabeth, Port Alfred, and East London, are chiefly engaged in the exportation of wool. Durban is the chief seaport and largest town of Natal, and an important coaling-station. A short distance inland is the capital, Pietermaritzburg.

The large inland towns of Johannesburg and Kimberley have been mentioned in Art. 288. Bloemfontein is the capital of the Orange Free State. Pretoria, a little north of Johannesburg, is the seat of administration of the Transvaal, and, since 1910, of the Dominion of South Africa (Art. 299). Lourenço Marques, on Delagoa Bay, in Portuguese East Africa, is of some importance as the nearest seaport to the Transvaal.

Rhodesia is a great undeveloped territory extending from the Limpopo river across the middle Zambesi to the south of Lake Tanganyika. It is chiefly occupied in cattle-raising, but there are mines of gold, silver, and coal which will some day be of importance, while the great water-power of Victoria Falls may be used electrically for industrial purposes. The chief towns at present are Bulawayo and Salisbury. Beira, in Portuguese territory, is the nearest seaport to southern Rhodesia. Chinde, farther north, is the port of the lower Zambesi. It is connected by rail with Blantyre, a growing centre of coffee plantations in the Shiré Highlands, south of Lake Nyasa.

Damaraland and Namaqualand, formerly "German South-West Africa," are now governed by the Union of South Africa. The capital is Windhoek, high up in the interior, and its seaport is Swakopmund, but the best harbour is at Walvis Bay. The country is on the whole very barren.

RAILWAYS

295. The "Cape to Cairo" railway is intended to link up Cape Town and Cairo, but there is little prospect of its completion in the near future, though in the north and south large sections are already open. What Central Africa most needs is railways from east to west, not from north to south. In the Nile valley the railway is open to some distance south of Khartoum (Fig. 56). In South Africa the main line from Cape Town runs through Kimberley, Mafeking, and Bulawayo, across the Zambesi at Victoria Falls, and northwards to the upper Congo. The other South African lines (Fig. 57) connect this main line with the southern and eastern ports from Port Elizabeth to Beira.

Though the Cape to Cairo railway is not likely to be completed as a through route, it is possible to travel from the Cape to Cairo by a combination of train, motor, and lake or river steamers. The upper Nile is navigable from Khartoum to Juba, from which there are motor roads to the equatorial lakes or to the Congo.

The Uganda railway runs from Mombasa, through Nairobi, the capital of Kenya Colony, to Port Florence on the north-east corner of Lake Victoria, thus affording easy access to the upper Nile basin. Another line runs from Dar-es-Salaam

to Ujiji on Lake Tanganyika, which is connected with the Upper Congo.

The rapidly-developing mineral district (copper, radium) of Katanga in Belgian Congo has a direct railway to the west coast through Portuguese territory to Lobito Bay.

In French West Africa the upper Senegal has been joined by rail to the upper Niger, so that it is possible to go by rail and river-steamer to Timbuktu.

In Nigeria a railway has been built northwards from Lagos through the Yoruba country to the Niger, and beyond it to Kano, the chief town in Northern Nigeria.

Several other short railways have been mentioned in previous sections. French North Africa (Algeria, Tunis) has an efficient railway system.

THE SUEZ CANAL

296. The Suez Canal, opened in 1869, is the most important ship canal in the world, as it shortened the voyage from western Europe to India and China by about 4,000 miles (10 days or more for cargo steamers), and also shortened the voyage to Australia, though to a much less extent.

The canal joins Port Said on the Mediterranean to Suez, at the head of the Gulf of Suez. The length is 87 miles, of which 66 miles are artificial and 21 miles consist of lakes. The canal will not take vessels drawing more than 32 feet of water, and thus the size of ships trading with the East is limited. On the average about twelve ships a day pass through the canal.

POPULATION AND POLITICAL DIVISIONS

297. The population of Africa is not known with any degree of accuracy, but is probably about 150 millions, or only about half the population of India. North Africa is chiefly inhabited by brown-skinned sections of the white (Caucasic) race—Moors, Arabs, Egyptians, Somalis, Abyssinians. From the southern edge of the Sahara southward nearly the whole population belongs to the negro or Ethiopic race, in two main divisions, the Sudan negroes in the north, and the Bantu negroes in Central and South Africa.

Only in the extreme north and south of Africa are there any considerable numbers of Europeans—French, English,

Greeks, and Italians in the north, English and Dutch (Boers) in the south. Even there the white people are largely outnumbered by the native races, and in the rest of Africa the only Europeans are a few administrators, traders, planters, missionaries, or explorers.

298. The only states in Africa not definitely under European control are the negro republic of Liberia, founded by freed slaves from America, Egypt, and Ethiopia (§ 243).

French Africa includes Morocco, Algeria, and Tunis in the north, nearly the whole of the Sahara (except Rio de Oro on the west coast, which is Spanish), the basins of the Senegal and upper Niger, the Ivory Coast, Dahomey, French Congo, and Obok in Somaliland. France also governs the only large African Island, Madagascar.

Portugal possesses a small part of the Guinea coast, and two large areas in the south—Angola and Portuguese East Africa. The only Belgian possession is the Belgian Congo. Italy controls part of Tripolitania and Libya.

The former German colonies in Africa have been entrusted by the League of Nations mainly to Britain and France; a small part of East Africa has been added to Belgian Congo. The "mandated" areas are: Togoland and Cameroon, divided between Britain and France; South-West Africa, administered by the Union of South Africa; and East Africa, administered by Britain, and now called Tanganyika Territory.

Egypt was till 1914 in theory part of the Turkish Empire, and paid tribute to Turkey. From 1882 to 1936, however, the British controlled the country with an army of occupation on account of the vital importance to the British Empire of the Suez Canal (Art. 296). In 1914 the country was made a British "Protectorate," but in 1922 became an independent kingdom. Since 1936 Egypt has been a sovereign state with the "Anglo-Egyptian Sudan" as a "Condominium," i.e. a joint government by Britain and Egypt.

299. The most important part of British Africa is the "Dominion of South Africa," formed in 1910 by the union of Cape Colony, Natal, the Orange Free State, and the Transvaal. The Dominion Parliament meets at Cape Town, but the seat of government is at Pretoria. Surrounded by the Dominion, but not forming part of it, is the very mountainous country

of Basutoland, ruled, like the Bechuanaland Protectorate further north, by semi-independent native chiefs.

To the north of the Transvaal and Bechuanaland is the great territory of Rhodesia. Adjoining this on the north-east is the Nyasaland Protectorate. In east central Africa Britain governs Kenya Colony, the Uganda Protectorate, and British Somaliland.

In West Africa the largest and most important British possession is Nigeria, and farther west are the Gold Coast Colony, Sierra Leone, and the small colony of Gambia.

AFRICAN ISLANDS

300. Africa has very few islands near it, and except Madagascar, they are all of small size and of volcanic origin.

On the west Portugal possesses the Madeira Isles and the Cape Verde Islands. The former are much visited by invalids on account of their splendid climate. They produce wine and fruit. St. Vincent, in the Cape Verde group, is an important coaling-station. Between the two above-named groups lie the Canary Islands, also a health-resort, belonging to Spain. The Peak of Teneriffe rises more than 12,000 feet above the sea. The chief towns are Santa Cruz, the capital, and Las Palmas, a coaling-station.

In the Bight of Biafra are the small islands of Fernando Po (Spanish), Principe, and São Thome (Portuguese). They are important, especially the last, for their production of cocoa. In the South Atlantic are the unproductive British islands of St. Helena and Ascension. St. Helena, the prison of Napoleon Bonaparte after his final defeat at Waterloo, was an important calling-place for sailing-ships, but its importance has greatly declined in recent times, owing to steam navigation and to the opening of the Suez Canal.

301. Madagascar, a French colony separated from Africa by the wide and deep Mozambique Channel, is one of the largest islands in the world (nearly twice the area of the British Isles). The island lies entirely in the trade-wind zone, and is therefore rainy on the east and moderately dry on the west. Its chief productions are cattle on the uplands of the interior, and rubber, rice, and sugar on the coastal plains. There is a large area of forest. The capital, Antananarivo, is near the

middle of the island; the chief port is Tamatave. The natives of Madagascar, called Malagasy, are of Malayan origin.

A little farther east are the small islands of Mauritius (British) and Réunion (French), both growing much sugar. The Seychelle Islands produce coco-nuts and coco-nut oil.

AFRICA

COUNTRY	AREA Sq. MILES (THOUSANDS)	POPULATION MILLIONS	PRINCIPAL TOWNS POPULATIONS IN THOUSANDS
BRITISH AFRICA.			
Kenya	221	3.5	Nairobi 100, Mombasa
Uganda	94	3.6	Entebbe, Mengo
Zanzibar	1	.2	
Nyasaland	48	1.6	Blantyre
Somaliland	68	.3	Berbera
Basutoland	12	.6	Maseru
Bechuanaland	275	.2	Serowe, Mafeking
Rhodesia	440	2.6	Salisbury 33, Bulawayo
Union of S. Africa			
Cape Province ..	277	3.3	Cape Town 320, Pretoria 80
Natal	35	1.7	Durban 280
Transvaal	110	2.8	Johannesburg 600
Orange Free State	50	.8	Pretoria 110 Bloemfontein 60
Nigeria	370	20	Lagos 120, Kano
Gold Coast	80	3	Accra 70, Cape Coast
Sierra Leone	28	2	Freetown 55
Gambia	4	.2	Bathurst 15
Anglo-Egyptian Sudan	1014	6	Khartoum 50
Mandated Territories:			
Tanganyika	373	5	Dar-es-Salaam 30
S.W. Africa	318	.3	Windhoek 10
Cameroon (part) ..	31	.8	
Togoland	13	.3	
Egypt	370	16	Cairo 1300 Alexandria 680

AFRICA—(continued)

COUNTRY	AREA Sq. MILES (THOUSANDS)	POPULATION MILLIONS	PRINCIPAL TOWNS POPULATION IN THOUSANDS
Abyssinia (Ethiopia) ..	360	7	Addis Ababa 120, Harrar 25
Liberia	40	1.5	Monrovia 10
Belgian Congo	900	12	Boma, Matadi, Leopoldville 42, Bukama, Elizabethville
FRENCH AFRICA.			
Morocco	160	6.5	Marrakesh 194, Casablanca 250, Rabat 80,
Algeria	220	7	Algiers 257, Oran 164
Tunisia	90	4	Tunis 215
French West Africa and Sahara	1800	15	Dakar 100, St. Louis 20, Timbuktu, Abomey
French Congo	500	9	Loango, Libreville
French Somaliland ..	46	.2	Jibuti 11
Madagascar	225	3.5	Antananarivo 125
Mandated Territories—			
Togo	22	.8	Lome
Cameroon	150	2.7	Duala, Yaunde
PORTUGUESE AFRICA.			
Portuguese Guinea	14	.8	Bolama S. Paulo de Loanda 40
Angola	485	4	Lourenço Marques 40,
Mozambique	290	3.5	Beira, Mozambique, Chinde
Italian Somaliland and Eritrea	284	1.5	Asmara 90, Mogadishu 50
Tripolitania and Cyrenaica	810	1.0	Tripoli 90 Benghazi 60

QUESTIONS ON CHAPTER XII

1. Where are the deserts of Africa? Explain their situation.
2. Describe the course of the Nile, and briefly account for the annual Nile flood. At what part of the year does it occur?

3. Describe the main physical features of Africa south of the Zambesi.

4. Name in order the African states bordering the Mediterranean, and give their capitals. State to what European power, if any, each belongs, and briefly describe their chief products and exports.

5. Draw a sketch-map of the Congo Basin, marking the course of the main river and its chief tributaries, lakes, falls, towns, and the chief natural productions.

6. On the given outline map (South Africa) mark the rivers Orange, Vaal, Limpopo. Draw the boundaries of the four provinces forming the Union of South Africa, and name these provinces. Mark the Little Karroo and Great Karroo, the Drakensberg and Lebombo Mountains, Walfish Bay, Lourenço Marques, East London, Johannesburg, Cape Town, Pietermaritzburg, Kimberley, Mafeking.

7. Describe the climate, natural resources, towns and ports of Nigeria.

8. What are the chief hindrances to navigation on the four great rivers of Africa?

9. Describe the situation of the following places, and give reasons for their importance: Alexandria, Cape Town, St. Helena, Lourenço Marques, Khartoum, Freetown, Timbuktu.

10. Name the towns marked by initials in Figs. 56, 57, 58.

11. Name the lakes shown in Figs. 56, 57.

12. Describe the course of the "Cape to Cairo" railway, as far as it has been completed.

13. What is the high veld of South Africa? If you were going to live there for a year, what differences of climate would you expect compared with the climate of the British Isles?

14. What are the chief differences between the African lands bordering the Mediterranean Sea east and west of Tunis?

15. Describe the main features of the Sahara Desert. What occupations are followed by the inhabitants?

16. Draw a sketch-map of Africa. Mark the equator, the rivers Nile, Niger, and Orange. Show, by shading, the part that has heavy rain all the year. Write the words: Bedouins, Boers, Hottentots, in the parts where these people live. Write the words: camels, lions, ostriches, where these are to be found in large numbers.

17. Write an account of the physical features, climate, and natural vegetation of either Natal or Egypt.

18. Draw sketch-maps of Africa to show the distribution of winds and rainfall in (a) January, (b) July.

19. In which African parts of the British Empire, and under what geographical conditions, are the following cultivated: cotton, cocoa, coffee?

CHAPTER XIII

NORTH AMERICA

GENERAL

302. North America is about twice as large as Europe, and on the average twice as high. The great mass of the continent lies between the Tropic of Cancer (which bisects Mexico) and the Arctic Circle. The central line from north to south is about on the meridian of 100° W. The greatest width of the continent is a little north of 50° N., and measures about 3,000 miles.

The north coast of the mainland lies about 70° N., and is fringed by a large barren archipelago extending to beyond 80° N., and joined to the mainland by ice every winter.

Separated from the archipelago by Davis Strait and Baffin Bay, is the large island of Greenland (belonging to Denmark), extending from Cape Farewell, 60° N., to an unknown distance beyond 80° N. It has an estimated area of about half a million square miles, but the interior is almost wholly unknown, being mostly covered with an immense ice-sheet, in some places at least 6,000 feet thick. Great glaciers project from this ice-sheet into the lower valleys and down the fjords, which are like those of Norway, but larger. It is calculated that Greenland discharges into the sea at least a thousand million tons of ice every year. Icebergs carried south by the Labrador Current are a considerable danger to Atlantic shipping, even south of Newfoundland, especially as fog is very prevalent in this area. There is a small area of habitable land on the west coast of Greenland, which is warmer than the east, owing to the direction of the currents (Fig. 22). The population consists of about 10,000 Eskimos and a few hundred Danes. The chief settlements are at Godthaab and Upernivik.

It was the main object of early Arctic explorers to find a "north-west passage" through the Canadian archipelago and Bering Strait into the Pacific. Such a route would be much shorter than the eastward voyage to the Pacific, but it is only possible during exceptionally favourable summers, and is quite useless commercially.

Another large archipelago, the West Indies, lies off the south-east of the continent, just within the tropic. The only other large islands are Vancouver and Newfoundland, about lat. 50° N., on opposite sides of the continent. Both are continental islands.

There is good evidence that the Vikings or Norsemen, after colonising Iceland and Greenland, discovered Newfoundland, Labrador, and Nova Scotia, somewhere about 1000 A.D. All memory of these discoveries, however, died out during the Middle Ages, and the history of America really begins with Christopher Columbus (Colon), who, sailing westward from Spain in 1492, reached the West Indies, which he took to be the islands to the east of Asia—hence the application to them of the name “Indies,” founded on a complete misunderstanding. Five years later John Cabot, sailing from Bristol, re-discovered Newfoundland, and further explorations, mainly by the Spaniards, quickly followed in Central and South America. It was chiefly the voyages of Amerigo Vespucci which made it clear, soon after 1500, that instead of reaching Asia, as Columbus thought, the explorers had discovered a “New World,” and gradually the name America came to be applied to both the newly-discovered continents—North and South America. In the course of the next 150 years numerous settlements were made, chiefly by the English, French, and Dutch in North America, by the Portuguese in Brazil, and by the Spaniards in Mexico, Central America, and South America outside Brazil.

Gradually, by about the middle of the eighteenth century, almost the whole of America north of Mexico (as far as it was then known) became British, but the successful revolt of thirteen British colonies in 1776 founded what has come to be the most powerful republic in the world, the “United States of America.” About half a century later the Spanish and Portuguese colonies followed this example, cast off their allegiance to the Old World, and became independent.

COASTS

303. The east coast consists of two very different portions, which meet in the neighbourhood of New York. From this point northwards the coast is generally lofty, rugged, and highly indented, with many small fjords besides large openings

like the Bay of Fundy and the Gulf of St. Lawrence. To the south of New York, on the other hand, there is a nearly flat coastal plain, narrow at first but widening out towards the south, and extending along the Gulf of Mexico to the Rio Grande. The coast is bordered for long distances by sand-bars and chains of low sandy islands. There are no large inlets, except in the north, where a slight local depression of the land has flooded the lower valleys, forming Delaware Bay and Chesapeake Bay.

On the west coast, from Vancouver Island northwards, the coast is rugged and full of fjords, closely resembling those of Norway. As in Norway, too, there are numerous islands, of which the most important, besides Vancouver, are the Queen Charlotte Islands. The west coast of the United States and Mexico is also mountainous, but very straight and uniform, with a great scarcity of good harbours. There are only two important gaps in the coast ranges, the mouth of the Columbia River and San Francisco Bay, and these have naturally become the sites of important ports. The long Gulf of California is a deep trough between mountain ranges.

Hudson Bay in the north and the Gulf of Mexico in the south may be compared in some respects with the Baltic and the Mediterranean in Europe. In both cases the northern sea is shallow, comparatively fresh, and frozen over every winter, while the southern one is deep, salty, and warm. Hudson Bay, however, is closed by ice for a much longer period than the Baltic.

LAND RELIEF

304. North America has two important mountain systems, each containing numerous ranges: (i) the Rocky Mountains, stretching from the Arctic Circle, in Alaska, to the south of Mexico, and (ii) the much lower and smaller Appalachian Mountains, from the mouth of the St. Lawrence to the Gulf Plain in Alabama. The still lower Laurentian Highlands (1,000 to 2,000 feet) extend from Lake Superior along the north of the St. Lawrence into Labrador.

The *Rocky Mountains* are the steep eastern edge of a complex system of ranges and plateaux which at its widest stretches across about one-third of the continent (Figs. 59 and 60). In this middle portion there are four ranges, viz.

the Rocky Mountains, the Wasatch Mountains, the Sierra Nevada, and the low Coast Range. Between the second and third of these is a high plain called the *Great Basin*, most of which has no outlet to the sea (Fig. 60). This is flanked on the north and the south-east by the *Columbia Plateau* and the *Colorado Plateau*, so named from their respective rivers. The Columbia Plateau is bounded on the west by the Cascade Mountains, a line of extinct volcanoes. The *Californian Valley* is a low, nearly flat trough between the Sierra Nevada and the Coast Range. The *Yosemite Valley* in the Sierra Nevada is remarkable for the grandeur of its precipices and waterfalls.

The Alaskan part of the Rockies contains the highest mountain in North America, Mount McKinley (20,000 feet),

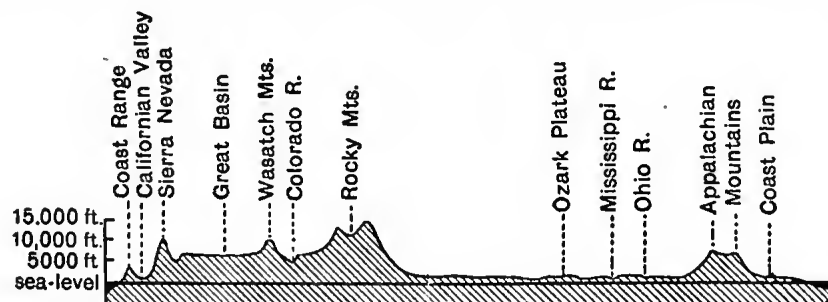


Fig. 59. DIAGRAMMATIC SECTION ACROSS UNITED STATES, ABOUT LAT. 38° N.

and also Mount Logan and Mount St. Elias (18,000 feet). The highest point of the Canadian Rockies, as far as they have been explored at present, is Mount Robson, about 13,700 feet, near the head of the Peace River. In the United States Long's Peak and Pike's Peak are over 14,000 feet, and Mount Whitney in the Sierra Nevada nearly 15,000. Not far from the latter is the Death Valley, part of which is below sea-level, as is also the "Salton Sink" farther south, which was once the head of the Gulf of California, but was cut off from it by silt brought down by the Colorado (Fig. 60).

The southern continuation of the Rockies forms the *Mexican Plateau*, flanked on both sides by ranges called the Sierra Madre, distinguished by the name east or west. At the southern end of the Mexican Plateau is a line of active

or dormant volcanoes, Orizaba (18,000 feet), Popocatepetl, Colima, and others. Beyond these the plateau sinks to the low *Isthmus of Tehuantepec*, which affords an easy route across the continent, now followed by a railway.

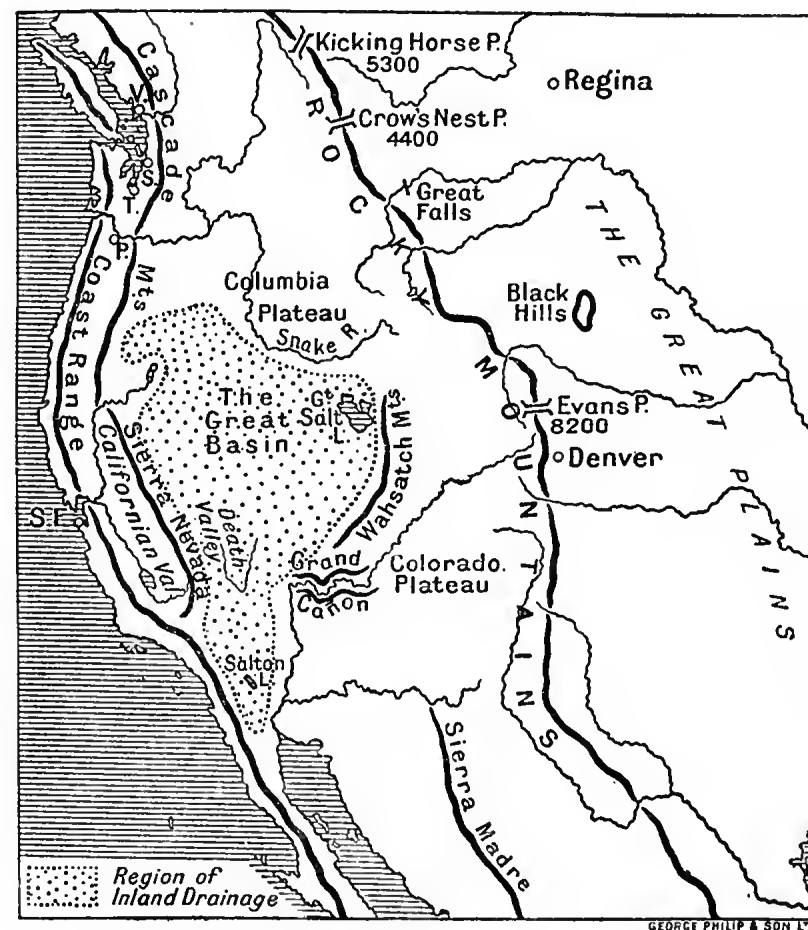


Fig. 60. WESTERN UNITED STATES.

305. The Appalachian Mountains, though lower and less extensive than the Rockies, are much more important commercially, on account of their immense wealth of coal, iron, and petroleum (Art. 317). They also form a considerable barrier between the fertile Atlantic coast plain and the still more fertile prairies of the middle of the continent.

In the north of the Appalachian system are the White Mountains, Green Mountains, and Adirondacks (Fig. 61), separated by the Connecticut river and Lake Champlain. Farther south, on either side of the Hudson, are the Hoosac and Catskill Mountains. The highest and widest part of the system, from Pennsylvania to Georgia, is called the Alleghany Mountains, and consists of a number of parallel forested ridges separated by deep troughs. The Blue Ridge of North Carolina and Virginia rises to 7,000 feet in Black Dome. The eastern border of the mountains, where the courses of rivers are broken by falls or rapids, is called the *Fall Line* (Fig. 61). It is important as marking the head of navigation on the rivers, and therefore the sites of important seaports.

On the west of the Alleghanies a broad platform called the *Alleghany Plateau* overlooks the prairies of the Ohio.

From Hudson Bay to the Gulf of Mexico a broad strip of lowland runs between the Rockies on the west and the Appalachian and Laurentian Highlands on the east. This is the great prairie region. It consisted originally in the east of open scattered forest (savanna), now mostly turned into cultivated land; and in the west of treeless plains, affording pasture for great herds of bison and deer, and, since these have disappeared, of cattle and sheep.

The greater part of North America, from the middle Mississippi northwards, was very severely "glaciated" during the Ice Age. The northern half of the continent was then covered, as Greenland is to-day, by a great ice-sheet, which (1) scoured out the basins now filled by the great lakes, and (2) when it finally disappeared, left the northern prairies covered with a deep layer of glacial drift or boulder-clay, forming a marvellously fertile soil.

RIVERS AND LAKES

1. ARCTIC SLOPE

306. The greatest Arctic river of the New World is the *Mackenzie* (2,500 miles), which takes the outflow from the three largest of the northern lakes, Athabasca, Great Slave Lake, and Great Bear Lake. The chief tributaries, the Athabasca and Peace River, come from the Rockies.

The most important river flowing into Hudson Bay is the *Nelson* from Lake Winnipeg. This lake receives from the

Rockies the Saskatchewan, and from the surrounding prairies the Assiniboine and Red River of the North. These two unite at Winnipeg.

2. ATLANTIC SLOPE

307. The St. Lawrence basin is chiefly important for the five "Great Lakes" which, with the river and certain short canals, provide a navigable waterway into the heart of the continent. The total length of the St. Lawrence, including the lakes, is over 2,000 miles, but only about 750 miles lie below the lakes. The source is the St. Louis river, which flows into the head of Lake Superior from the "*Height of Land*," a low plateau in which the Mississippi and the Red River of the North also rise. The largest of the five lakes, Superior, is bigger than Scotland; the smallest of them, Ontario, is bigger than the largest lake in Europe.

There are only small differences in level between Lakes Superior, Michigan, Huron, and Erie, but between Erie and Ontario the Niagara River carries the whole outflow of the four upper lakes over a ledge of rock, forming the magnificent *Niagara Falls*, 160 feet high. The falls supply electric power to many towns in the neighbourhood. The Welland Canal, a little west of Niagara River, enables ships to ascend by means of locks from Lake Ontario to Lake Erie.

The passage between Lakes Superior and Huron, at Sault Ste. Marie, is obstructed by rapids, but two ship-canals have been cut (the "Soo" canals), one in the United States and one in Canada. These canals, with the Welland Canal, thus make all the five lakes into one for purposes of navigation.

The chief tributary of the St. Lawrence is the Ottawa, on the left bank. This may in time be connected by canal with Lake Huron, thus providing a shorter waterway to the upper lakes. On the right bank the chief tributary is the Richelieu, from Lake Champlain.

The great disadvantage of the St. Lawrence system is that navigation is stopped by ice every winter. Montreal Harbour is only open for about eight months each year, from April to November inclusive.

308. Fig. 61 shows the most important Atlantic rivers of the United States, the Connecticut, Hudson, Delaware, Susquehanna, Potomac, and James. The Hudson is the most

important of these, because it provides a deep navigable waterway northwards as far as Albany, where the Hudson is joined by the Mohawk. The wide valley of this river has always been important as an easy route from the Atlantic

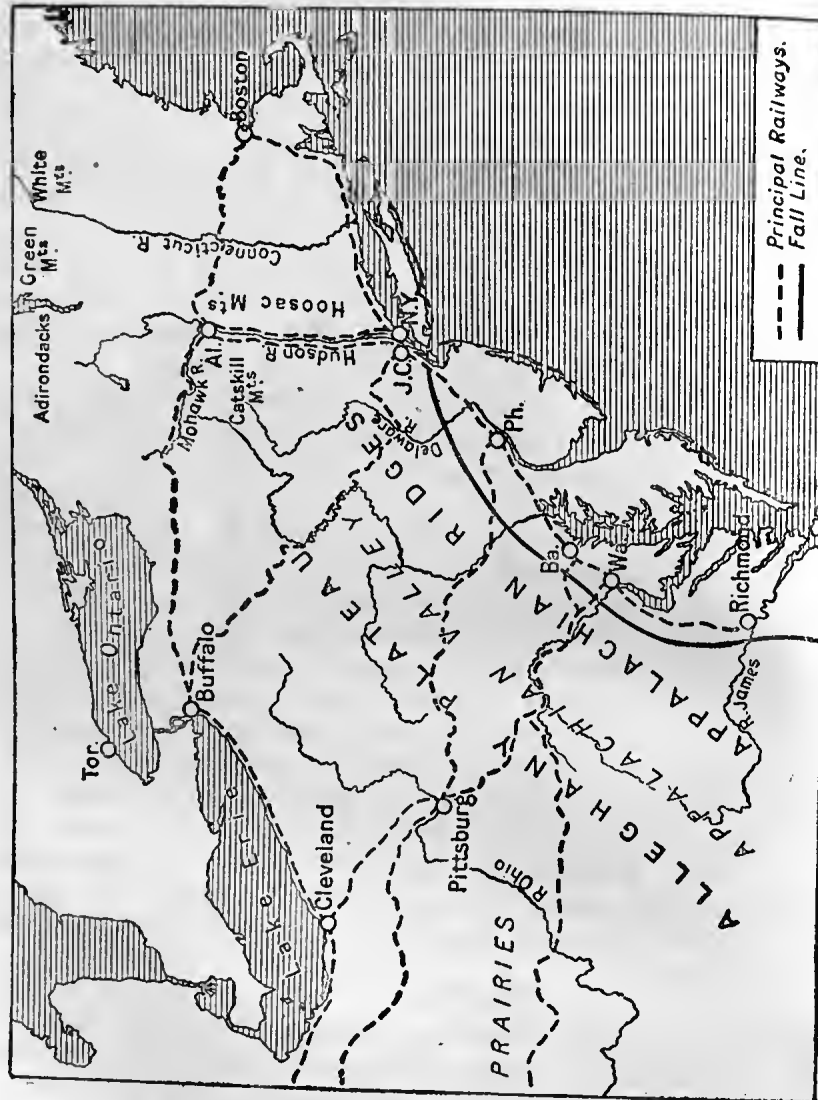


Fig. 61. NORTH-EASTERN UNITED STATES.

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seaboard to the lakes. It is traversed by the Erie Canal, connecting the Hudson with Buffalo on Lake Erie. The Hudson is also joined by canal to Lake Champlain, and so to the St. Lawrence.



THE GREAT WALL OF CHINA.
Built about 200 B.C. for the defence of North China against barbarians from Central Asia.
"Wide World" Photos.

The rivers farther south are only navigable as far as the Fall Line (Art. 305 and Fig. 61). Their valleys, however, especially those of the Susquehanna and Potomac, have been important in facilitating the construction of railways through the Appalachians. These shallow mountain rivers are used for floating timber down to the sea.

3. GULF RIVERS

309. The *Mississippi* (4,200 miles) is the greatest river of North America, and one of the greatest in the world. Its basin occupies more than one-third of the area of the United States. The source of the river is Lake Itasca, near the head of Lake Superior. The river is shallow as far as the *Falls of St. Anthony* at Minneapolis, but below these falls it is navigable by fair-sized steamers.

The lower Mississippi (below St. Louis) flows through a flat swampy "flood-plain," about 30 miles wide, built up of alluvium brought down by the river itself. This plain is very fertile, but is so liable to be flooded that it is mostly uncultivated. A considerable part of it is lower than the bed of the river, which is confined by artificial embankments or levées. The river ends in a great mud delta, shaped like the fingers of a hand, and rapidly extending into the Gulf of Mexico.

310. The chief tributaries on the right bank come from the Rocky Mountains. Much the largest of these is the Missouri, which is longer than the main river. It is navigable as far as *Great Falls* in Montana, a series of falls with a total height of about 300 feet. The chief tributaries of the Missouri are the Yellowstone, Platte, and Kansas.

The first of these rivers is chiefly of interest because round its source an area about as large as Yorkshire, called the *Yellowstone National Park*, is preserved as a home where wild animals, such as bison and bears, elsewhere almost exterminated, may live in freedom. The Park has hot springs, geysers, and volcanoes only recently extinct, and is an area of magnificent scenery.

The other western tributaries of the Mississippi are the Arkansas and Red River.

The only great eastern tributary is the Ohio, the upper part of which, as far as Pittsburg (Fig. 61), is called the Alleghany, and is connected by canal with Lake Erie. The

Ohio flows through the chief tobacco-growing region in America. It is navigable below Pittsburg, and is joined by the Tennessee just before its confluence with the Mississippi.

The small tributary Illinois is joined by canal to Chicago on Lake Michigan.

The only other important river flowing into the Gulf is the *Rio Grande del Norte*, the lower part of which is the boundary between the United States and Mexico. The river is in many ways like the Colorado (Art. 311), flows through similar barren country, has deep cañons in its upper course, and is unnavigable.

4. PACIFIC SLOPE

311. The *Yukon* flows from the St. Elias Range through Alaska into Bering Sea. The upper river is navigable during the few weeks in summer when it is not frozen, but the delta is silted up. The *Yukon* basin is only important on account of the gold-fields of the Klondike, a small right-bank tributary in the Canadian part of the river.

As the main mountain system of the continent lies so near the west coast, it naturally follows that the western rivers in general are comparatively short, rapid, and useless for navigation. The *Fraser*, the chief river of British Columbia, and the parallel but longer *Columbia* are very rich in salmon, which form an important export of this region. The Snake River, the chief tributary of the *Columbia*, has cut a remarkable deep cañon in the *Columbia Plateau* (Fig. 60). The *Sacramento* and *San Joaquin* irrigate the fertile Californian Valley, and unite before flowing into San Francisco Bay.

The *Colorado* (Fig. 60), which flows into the Gulf of California, is one of the most remarkable rivers in the world. The river flows over a very dry plateau, and as there is hardly any "weathering" (rain or snow) to round off the bare rock surfaces, the river has cut a valley with almost vertical sides, and in many places so narrow at the bottom that it is scarcely possible to pass on foot along either side of the stream. The *Grand Cañon* is over 200 miles long, and in some places 6,000 feet in depth.

The lower Colorado occasionally overflows and floods the "Salton Sink," which is below sea-level. When the river is restored to its ordinary channel a lake is left, which gradually dries up.

CLIMATE

312. The Atlantic coast plain and the lower Mississippi basin have a rather heavy rainfall with a maximum in summer. The heavier summer rainfall is really a monsoonal effect, though it is much less marked in America than in south-eastern Asia. In general, except in the "horse latitudes," almost every part of the world has more summer than winter rain. The south of this region is sub-tropical and fairly equable in temperature—Florida is about as warm in winter as England in summer. Further north the average temperature, of course, decreases, and there is a greater difference between summer and winter temperatures. As the south-east of the continent is warmed by the Gulf Stream, so the north-east is cooled by the Labrador Current (Art. 67 and Fig. 23).

The central plains and prairies have dry, very cold winters, and (except in the extreme north) hot, moderately rainy summers. The rainfall diminishes from east to west until the Rockies are reached. In central Canada and northern U.S.A. there is a very great difference between winter and summer temperatures. (See the figures for Port Arthur in the following table, Art. 314.)

313. In the western mountain system we can distinguish broadly three climatic regions—

(i) In the south a very dry region, including north-west Mexico and most of the states of Arizona, Utah, and Nevada. It is represented approximately by the dotted area in Fig. 60 plus the basin of the Colorado. This region contains the only true deserts in North America. Its dryness is chiefly due to the wall of mountains surrounding it.

(ii) From about 32° N. to 40° N. the coast ranges and the Californian Valley have a "Mediterranean" climate, with rainy winters and very dry summers. In winter this region is just within the belt of rain-bearing westerly winds, while in summer it is on the margin of the trade-winds, here offshore and dry. California is remarkably equable in temperature (see figures for San Francisco), partly on account of the influence of the cool Californian Current (Fig. 24).

(iii) In the north-west, from about Vancouver Island to Alaska, is a region of equable temperature and of heavy rainfall occurring at all seasons of the year. The weather of this region, like that of the British Isles, which closely resembles it, is mainly due to the westerly variable winds of the north temperate zone.

Mexico and the West Indies lie almost wholly in the trade-wind zone. As we should expect, they have therefore heavy rain, especially on eastward-facing slopes and in summer, when the trade-winds are strongest. The difference between the rainy summer and the dry winter is much more marked in Mexico than in the West Indies. The interior of Mexico, owing to its elevation, has a comparatively cool, temperate climate.

The West Indies are subject to hurricanes in the summer and autumn. The storm centre usually follows a curved track north of, and parallel to, the larger islands and the east coast of Florida. Tornadoes, smaller in extent than hurricanes, but even more destructive, are not infrequent in the lower Mississippi valley. The town of Galveston, one of the chief ports on the Gulf of Mexico, was almost completely destroyed by a tornado in 1900.

Notice the general resemblances between the climates of North America and of Eurasia: (i) a very great range of temperature inland (Siberia, Central Canada), (ii) a mild, equable, rainy north-west (British Isles and Norway, British Columbia), (iii) a hot, rainy south-east (Indo-China, the Gulf Coast), (iv) deserts in the south-west (Persia and Arabia, Arizona and N.W. Mexico). The climates with least variation are in the south-eastern islands (East and West Indies). The annual range at Nassau is only 11° , while at Montreal it is 57° .

The climate of San Francisco has some curious features. Not only is it cooler than London in summer (though in the latitude of Sicily), but September and October are actually warmer than July and August. This is due to the intense heat inland in the Sacramento valley during the height of summer. This brings a current of cool air, with much sea-fog, through the gap in the coast range on which San Francisco stands. By September the Sacramento valley has begun to cool, and the west winds are less constant, and there is much less fog.

314. The following table gives a few climatic data for North America:—

AVERAGE TEMPERATURE: $^{\circ}$ F.

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
St. John's ..	24	23	29	35	43	50	59	59	54	45	38	29
Montreal ..	13	15	26	41	55	65	70	67	59	47	33	20
Port Arthur	6	8	20	36	46	57	63	59	53	41	27	13
Edmonton ..	6	11	23	41	51	57	61	59	50	42	24	16
Vancouver ..	36	38	42	47	54	59	63	62	56	49	43	38
San Francisco	50	52	54	55	57	59	59	59	61	61	56	51
Yuma (Arizona)	54	59	64	70	77	85	92	91	84	73	62	56
Nassau (Bahamas)	71	72	73	75	78	80	82	82	82	80	76	73
Mexico City	54	57	60	64	65	64	62	62	61	59	56	53

AVERAGE RAINFALL: INCHES

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
St. John's ..	6.3	5.7	4.7	4.3	3.2	3.9	3.7	3.7	3.5	6.2	6.0	5.4
Montreal ..	3.8	3.2	3.5	2.5	3.0	3.5	3.7	3.5	3.5	3.2	3.5	3.7
Port Arthur	.8	.8	.9	1.5	2.0	2.7	3.8	2.8	3.3	2.5	1.5	.8
Edmonton ..	.8	.7	.7	.8	1.9	3.3	3.6	2.5	1.3	.4	.1	.1
Vancouver ..	8.6	6.1	5.3	3.3	3.0	2.7	1.3	1.7	4.1	5.9	10.0	7.8
San Francisco	4.3	3.7	3.1	1.8	.8	.2	—	—	.3	1.3	2.5	4.3
Yuma (Arizona)	.4	.5	.3	.1	—	—	.1	.3	.1	.2	.3	.4
Nassau (Bahamas)	2.2	1.7	1.6	2.4	5.6	6.7	5.7	6.5	7.4	6.3	2.8	4.8
Mexico City	.2	.2	.6	.6	1.9	3.9	4.1	4.7	4.1	1.8	.5	.2

VEGETATION AND ANIMALS

315. The extreme north of Canada and of Alaska are occupied by tundras or "*Barren Lands*." South of this is a wide belt of sub-arctic forest (spruce, larch, pine) extending from Alaska to the mouth of the St. Lawrence, and passing in the east, without any clear division, into the mixed temperate forest (oak, pine, maple, etc.) which at first covered nearly all the east of the continent from the Great Lakes to

being mostly quarried instead of mined, and that it can be taken cheaply by lake and canal to the steelmaking towns of Pennsylvania, especially Pittsburgh.

There is not as yet much production of iron in Canada. Rich mines are worked on Bell Island, north-east of Newfoundland, and the ore is smelted at Sydney, on the Cape Breton coal-field.

Till recently the chief petroleum district has been a large oval area south of and parallel to Lake Erie, and having its centre at Pittsburgh. There are thousands of wells, from which the crude natural oil is pumped into refineries, where it is separated by distillation into illuminating oil, lubricating oil, petrol, vaseline, and other products. The refineries are connected by "pipe lines" with several Atlantic seaports, which export the oil in tank-steamers.

The Pennsylvania oil-production has greatly diminished, but new oil-fields have been developed in California, Oklahoma, Texas, Mexico, Illinois, Ontario.

OTHER MINERALS

318. Gold is found chiefly in the western mountains, especially in Colorado, California, and the Kootenay District of British Columbia. New gold mines are being developed in Northern Ontario.

The chief copper mines in North America are in Mexico, Montana, Arizona, and the Keweenaw Peninsula on the south side of Lake Superior.

The United States is the greatest producer of silver in the world, especially in Montana and Nevada. Mexico also raises much silver. In Canada there is a large and rapidly growing production of silver at Cobalt, near the Ottawa river in the north of Ontario. Sudbury, in the same province, has important nickel mines. The province of Quebec produces about three-quarters of the world's supply of asbestos.

The Klondyke goldfield is only accessible by the Skagway route. Skagway is at the head of a long estuary, the Lynn Canal, in the south of Alaska, and from it a railway about 100 miles long leads over the White Pass to Whitehorse, from which the Yukon can be navigated down to Dawson City. The Yukon district has now a much smaller population than it had ten years ago, as the yield of gold is diminishing.

OCCUPATIONS, INDUSTRIES, AND TOWNS

A. CANADA AND NEWFOUNDLAND

319. Newfoundland, the oldest British colony (1583), is an island larger than Ireland, with a rocky highly-indented coast. It is separated from Labrador by the strait of Belle Isle, and from Cape Breton Island by Cabot Strait. The capital and only large town, St. John's, is in the peninsula of Avalon in the south-east. A great majority of the inhabitants of the island are engaged in fishing. The *Grand Banks* are a large area of shallow water to the south of Newfoundland, and are the greatest cod-fishery in the world. They are crowded in summer with fishing-vessels from both Newfoundland and northern U.S.A., as well as from the small French islands of St. Pierre and Miquelon, south of Newfoundland.

The new industry of paper-making from wood pulp has been lately developed in Newfoundland.

320. The three small provinces of the east of Canada, Nova Scotia, Prince Edward Island, and New Brunswick, are farming countries of no great fertility, with extensive forests. Halifax, capital of Nova Scotia, and St. John in New Brunswick, at the mouth of the St. John river, are the two chief ports, and have the advantage of being free from ice when the St. Lawrence is frozen over. Thus they are the only Atlantic ports of Canada during the winter. The capital of Prince Edward Island, the smallest and most densely populated Canadian province, is Charlottetown, and the capital of New Brunswick is Fredericton, an inland agricultural centre on the St. John river.

321. Mails from Europe for Canada are landed in summer at Rimouski, on the south side of the estuary of the St. Lawrence, completing their journey by rail. Quebec, the "Gibraltar" of America, is at the head of the estuary, at the lowest point where the river can be bridged. It lies on a rocky promontory between the St. Charles River and the St. Lawrence, and is the oldest and most French city in Canada. It exports much timber. The St. Lawrence above Quebec has been deepened so that the largest ships can reach Montreal, built on an island at the confluence of the Ottawa with the main river. Hence Montreal has become the largest town and

chief commercial centre of Canada, at the head of ocean navigation and the beginning of river and lake navigation.

Ottawa, on the river of the same name, is the capital of the Dominion of Canada, and is chiefly a governmental city; a suburb called Hull has a large trade in timber, and manufactures wood pulp for paper-making.

The Peninsula of Ontario, bounded by Lakes Huron, Erie, and Ontario and the Ottawa river, is the most productive and best cultivated part of Canada. It extends farther south than any other part of the Dominion, and can grow peaches and grapes in the open during the hot summer. Grain crops, cattle, fruit, and timber are important, and there are rich mines in the north at Sudbury and Cobalt (Art. 318). The chief towns in Ontario are on Lake Ontario—Kingston, Toronto, and Hamilton. Toronto is the capital of the province and the second town in Canada. London (on the Thames, in Middlesex) is the chief inland agricultural centre.

The most important Canadian towns on Lake Superior are Port Arthur and Fort William, which send coal and manufactured articles westward by rail and wheat eastward by steamer.

322. The great town of the Canadian prairies is Winnipeg (which is *not* on Lake Winnipeg). Winnipeg is in the richest part of the wheat belt (the Red River valley), and owing to its situation half-way between Lake Winnipeg and the United States frontier, it was necessary that all Canadian railway lines across the continent should pass through or near Winnipeg, which is already a great railway centre and is likely to become still more important in this respect. The population grew from 42,000 in 1901 to about 220,000 in 1931. The second town in Manitoba is Brandon, which is also growing rapidly.

The western prairies of Canada (Saskatchewan and Alberta) are the part of the Dominion that is developing most rapidly by immigration and cultivation of new land. Saskatchewan is mainly agricultural, Alberta mainly pastoral. In both are a number of towns, small at present, but rapidly growing in size and importance. These two provinces form the greatest wheat area of Canada.

In Saskatchewan are Regina, the capital of the province, and the new towns of Saskatoon, Battleford, and Prince Albert farther north.

In Alberta the capital, Edmonton, is an important railway centre on the National Railway (Art. 331). In the south of the province are Calgary and Lethbridge, the latter a coal-mining centre.

323. British Columbia is the Pacific province of Canada, the most mountainous, most undeveloped, and till recently the least known of the provinces. Like the rest of Western Canada, it is growing very quickly in population, and has a most promising future. It contains part of the main chain of the Rockies, the Selkirk, Cascade, and Coast Ranges, and others. The small population is mainly engaged in mining, fishing, fruit-growing, and "lumbering" (timber-cutting). Thus its resources are much more varied than those of the prairies. The northern part of the province is still largely unknown and unoccupied. Part of it, however, is traversed by the National Railway, which has its terminus at Prince Rupert, at the mouth of the Skeena. The largest town in the province is Vancouver, the western terminus of the Canadian Pacific Railway. At the mouth of the Fraser is New Westminster, a centre of the salmon fishery. On Vancouver Island are Nanaimo, the centre of a coal-field, Victoria, the capital of British Columbia, and Esquimalt, a fortified naval station.

The Territories of Canada, which have not yet reached the rank of provinces, consist of Yukon and the North-West Territories. A large part of the area consists of "Barren Lands," and the small population (about 12,000) is composed of gold-miners (in Yukon) and fur-hunters and trappers.

B. UNITED STATES

324. In the United States we may broadly distinguish the following regions: manufacturing in the north-east, from Maine to Pennsylvania, with important fisheries off Maine; mining and lumbering in the Appalachian region; agriculture, and industries dependent on agriculture, such as flour-milling, bacon-curing, meat-canning, etc., in the central prairies and the Atlantic coast plain; "ranching," or rearing live stock, in the western "Great Plains" at the foot of the Rockies; mining in the western mountains, with some agriculture and lumbering in California and the Columbia basin.

325. Fig. 61 shows the chief ports and towns of the north-eastern States, the most important commercial and manufacturing region in the New World. The great port of the six "New England" States is **Boston** in Massachusetts. Its suburb of Cambridge contains one of the most famous American universities (Harvard). Not very far from Boston are the large manufacturing towns of Lawrence, Lowell, Worcester, Providence, Fall River, chiefly making cotton and woollen goods, and making considerable use of water-power, which is abundantly provided by the rivers. Portland in Maine is a large fishing centre, and being the nearest ice-free port to Montreal, is used in winter by some Canadian steamers.

New York, the largest city in the world after London, began as the Dutch settlement of New Amsterdam on the small island of Manhattan at the mouth of the Hudson. The island, which has long been built over, is connected by a great bridge with Brooklyn on Long Island, and by ferries and a tunnel with Jersey City and Newark on the right bank of the Hudson. "Greater New York," which includes these and other suburbs, owes its importance mainly to its easy connections by the Hudson and Mohawk valleys with the lakes and prairies, and to its fine deep harbour, capable of accommodating the largest ships yet built.

The summit level of the railway from New York to Buffalo through the Mohawk Gap is only about 440 feet, while most of the lines farther south through the Appalachians have to rise to 2,000 feet or more. The Mohawk Gap is also traversed by the Erie Canal, which has been several times enlarged since it was first cut (1825), and will take barges of 1,000 tons.

326. South-west of New York lie the important ports of **Philadelphia** on the Delaware and **Baltimore** on Chesapeake Bay. The former makes locomotives and ships; the latter exports wheat and flour, and cans the oysters for which Chesapeake Bay is famous. **Washington** on the Potomac is the seat of government of the United States. **Richmond**, the capital of Virginia, on the James River, is a great tobacco port.

Pittsburg, at the head of navigation on the Ohio, and connected by canal with Lake Erie, is the greatest centre of iron and steel manufacture, making use of great local supplies not only of coal but of natural gas.

The lake ports include several of the chief inland towns of U.S.A. Foremost among them is **Chicago**, at the southern end of Lake Michigan. Its position is such that all routes from the great wheat-belt of the north central States naturally converge there in order to round the lake and reach the Atlantic ports. Hence Chicago has become perhaps the greatest railway centre of the continent. It has an immense trade in wheat, timber, cattle, and meat products. Other important lake ports are Duluth, at the head of Lake Superior; Milwaukee, on the west of Lake Michigan; Detroit, with the Ford motor works, on the St. Clair River between Lakes Huron and Erie; Toledo and Cleveland, on Lake Erie; Buffalo, at the foot of Lake Erie, obtaining electric power from Niagara Falls; Rochester, on Lake Ontario.

327. The chief towns on the Mississippi are Minneapolis and St. Paul, flour-milling cities near the Falls of St. Anthony, which supply them with power; St. Louis, near the junction of the Missouri, a great river-port and railway centre, in the middle of the maize belt; Cairo, at the junction of the Ohio; Memphis, in the north of the cotton belt; and finally New Orleans, about 100 miles from the mouth of the river. It is the chief seaport of the Gulf of Mexico, its staple export, of course, being raw cotton, which goes chiefly to England, but partly also to the New England States.

Other cotton ports are Galveston and Mobile, on the Gulf of Mexico, and Charleston and Savannah on the Atlantic coast.

The Ohio has two large towns on it besides Pittsburg—Cincinnati, a great "pork-packing" place, and Louisville, a centre of the tobacco trade.

The Missouri flows through some of the richest wheat and maize land in the States, and has two large commercial towns on it, Omaha and Kansas City. Denver, on the South Platte river, is on the high western plains at the foot of the Rockies. The main industry of the western plains is cattle-rearing, and there are important mines of gold, silver, and lead in the mountains to the west:

Salt Lake City is the only considerable town of the Great Basin. Its surroundings have been made fertile by irrigation.

The great Pacific port of U.S.A. is San Francisco, on a gap in the Coast Range. Los Angeles, the largest town of Western America, is the chief home of the "film" industry and has a

great export of petroleum. Farther north Portland, on the Columbia, and Tacoma and Seattle, on Puget Sound, export the wheat and timber of Oregon and Washington, the last portions of the United States to be occupied and cultivated.

C. MEXICO

328. Mexico is chiefly important to the outer world on account of its great wealth of minerals, especially petroleum, lead, silver, copper, and other metals. The unhealthy coast lowlands produce rice, sugar, and cotton, as in southern U.S.A. The central plateau grows maize and wheat, and affords pasture for cattle and sheep. Henequen or sisal hemp is the chief commercial production of the low peninsula of Yucatan.

The chief Atlantic ports of Mexico are Tampico, Vera Cruz, and Coatzacoalcas (or Puerto Mexico). The first of these is near the great mining and smelting centres of San Luis Potosi and Monterey. Vera Cruz is the port of the capital, Mexico, which is situated in a valley about 7,000 feet high, near Lake Tezcuco, a shallow basin without outlet.

On the long Pacific coast of Mexico are the ports of Salina Cruz, Acapulco, Manzanillo, and Guaymas, which are naturally of less importance than the Atlantic ports, on account of their distance from the world's great markets.

There is a railway across the low Isthmus of Tehuantepec from Salina Cruz to Coatzacoalcas, but the opening of the Panama Canal has diverted much trade from this route.

D. WEST INDIES

329. The West Indian Archipelago is divided into four groups—

(i) The low **Bahama Islands**, wholly formed of coral, and surrounded by innumerable reefs or "cays."

(ii) The mountainous **Greater Antilles**, containing the four large islands of Cuba, Jamaica, Hispaniola, and Porto Rico.

(iii) The **Lesser Antilles**, a double row of many small islands, partly volcanic and partly coral, somewhat absurdly divided into the Leeward Islands and the Windward Islands.

(iv) **Trinidad** and another group of Leeward Islands off the coast of Venezuela stand on the continental shelf of South

America, and may be regarded geographically as part of that continent. Except Trinidad they are of little importance.

The Greater Antilles contain mountain ranges in an east and west direction: the Sierra Maestra in the south of Cuba, the Blue Mountains in Jamaica, the Ciabo Chain in Hispaniola. The volcano of Mont Pelée in Martinique is famous for an eruption which in 1902 completely destroyed the large town of St. Pierre. The West Indies have often suffered severely from earthquakes, volcanoes, and hurricanes.

330. The Bahamas export sponges and cotton. In the other islands the main object of cultivation was formerly sugar, but this industry was severely injured by the growth of the beet-sugar industry in Europe. Tropical fruits, bananas, pineapples, oranges, etc., are important. Cuba is famous for tobacco as well as sugar, Jamaica for rum, and Montserrat for limes (a kind of lemon). Trinidad possesses at La Brea a remarkable "lake" (semi-solid) of pitch or asphalt, from which large quantities are exported. It also cultivates cacao (cocoa). Barbados is the most densely populated of the islands, having more than 1,000 people per square mile.

The chief towns in the West Indies are Havana, capital of Cuba, famous for cigars; Kingston, capital of Jamaica; Port au Prince, capital of Haïti; San Domingo, capital of the republic of the same name; San Juan in Porto Rico; Bridgetown in Barbados; and Port of Spain in Trinidad.

Bermuda is a small group of coral islands, forming a British colony, about 700 miles north-east of the Bahamas. They are farther north than any other coral land, as the water round them, owing to the Gulf Stream, is warmer than anywhere else in the same latitude. Owing to their mild climate the islands are a favourite winter resort for Americans, and are also fortified and garrisoned as a naval station.

RAILWAYS

331. North America has a very extensive railway system, still being rapidly extended in Canada. Fig. 63 shows only the main transcontinental lines which had been completed in 1913, and omits the very numerous connexions, north and south lines, and minor railways, as well as all the Mexican lines.

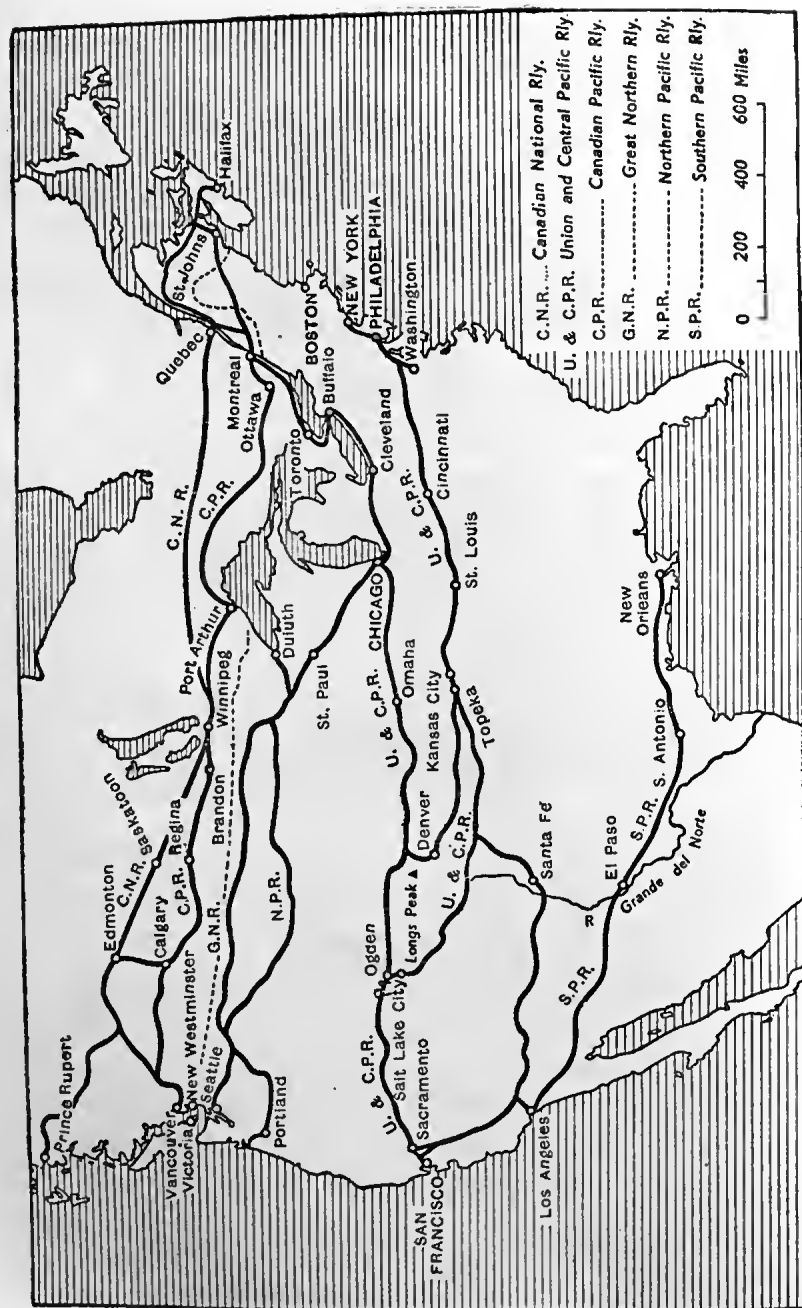


Fig. 63. RAILWAYS OF THE UNITED STATES AND CANADA.



Exclusive News Agency.

JUNKS ON THE YANGTZE-KIANG, CHINA.
Many thousands of Chinese live permanently in their boats on the rivers.

In Canada two complete lines now run from Atlantic to Pacific. Of these the Canadian Pacific (C.P.R.), joins Halifax with Vancouver, via Montreal, Ottawa, Port Arthur, Winnipeg, Regina, Calgary. It crosses the main chain of the Rockies at Kicking Horse Pass, about 5,300 feet high; crosses the Columbia River (twice) and the Selkirk Range, and descends the lower valley of the Fraser to Vancouver. The C.P.R. has numerous connexions southward with the States, while a northern branch leads to Edmonton.

The Canadian National Railway is an important state-owned transcontinental line. It starts from Moncton in New Brunswick, crosses the St. Lawrence by a great high-level bridge just above Quebec, and runs to Winnipeg along a route considerably further north than the C.P.R. Between Winnipeg and Edmonton is an extensive prairie section. The mountain section develops a very little known part of British Columbia, thought to be very rich in minerals. The line crosses the Rockies by the Yellowhead Pass (3,700 feet), and then divides, the two branches following the rivers Fraser and Skeena to Vancouver and Prince Rupert respectively.

The main lines of U.S.A. are far too numerous to be described here. Perhaps the most important of them is the Union and Central Pacific, the route of which should be traced out on a physical map. The traveller from San Francisco may reach New York either through Omaha and Chicago or through St. Louis and Cincinnati. The mountain section of the line is for more than 1,200 miles over 4,000 feet high, and in crossing the main chain of the Rockies at Evans Pass rises to over 8,000 feet. The lines through the Appalachians from Pittsburg to the Atlantic ports (Fig. 61) have steep gradients and sharp curves. The prairie sections, on the other hand, were particularly easy to construct.

POLITICAL DIVISIONS AND POPULATION

332. The mainland of North America contains three large countries—

- (i) The self-governing British "Dominion of Canada."
- (ii) The federal Republic of the "United States of America."
- (iii) The Republic of Mexico.

Newfoundland is not a part of Canada, but a separate self-governing Dominion. Alaska is a territory of the United States.

In the West Indies political divisions are much more complicated. Cuba is a republic, nominally independent, but really under the protection of U.S.A., which also governs Porto Rico. Hispaniola is divided between the two barbarous negro republics of Haiti and San Domingo, now practically controlled by the United States.

Jamaica is the most important British possession in the West Indies, but Britain also possesses Trinidad, the Bahamas, and most of the Lesser Antilles, in which, however, France owns Guadeloupe and Martinique, while the United States and Holland possess a few of the smaller Leeward Islands.

333. The inhabitants of North America before the European invasion were "Red Indians" in most of the continent, or Eskimo in the far north. The Red Indians have now nearly vanished from Canada and U.S.A., but still form a large proportion of the inhabitants of Mexico. The ruling tribe in Mexico before the Spanish conquest were called Aztecs. They had attained a considerable measure of civilisation, and have left many monumental remains in the south of the country.

The people of European descent in North America are, in Mexico, almost wholly Spanish, and in the rest of the continent, mainly, but by no means entirely, British. Canada belonged to France till 1759, and a considerable number of the inhabitants of eastern Canada, especially in the province of Quebec, are French in race and language. U.S.A. and Canada formerly received large numbers of immigrants from all parts of Europe, but mainly from the British Isles and Germany, while Russia and Italy also contributed large numbers. There are now severe restrictions on immigration. Florida and California belonged to Spain till early in the nineteenth century, and contain a small minority of people of Spanish blood.

There are about eleven million negroes—descendants of African slaves—living mainly in the southern United States.

334. The only part of North America which has at present a fairly dense population is the north-east of the United

States—the great manufacturing region, with many important seaports. The Atlantic States from Massachusetts to Maryland (including New York and Pennsylvania) have an area about one-twentieth of that of U.S.A., but contain about one-fourth of the population. The North Central States, especially Ohio, Indiana, and Illinois, also have large populations.

The eleven mountain states of the west of U.S.A., with a total area of over a million square miles, have a smaller total population than "Greater New York," and of this total more than one-third is in California alone.

LARGE TOWNS OF NORTH AMERICA

(Not including Capitals)

CANADA (1941)			UNITED STATES—(continued)		
		Population Thousands			Population Thousands
Montreal ..	..	903	Baltimore ..	..	856
Toronto ..	..	667	St. Louis ..	..	814
Vancouver ..	..	275	Boston ..	..	770
Winnipeg ..	..	222	Pittsburg ..	..	668
Hamilton ..	..	166	San Francisco ..	..	631
Quebec ..	..	151	Milwaukee ..	..	588
Edmonton ..	..	94	Buffalo ..	..	575
Calgary ..	..	89	New Orleans ..	..	493
Halifax ..	..	70	Minneapolis ..	..	491
UNITED STATES (1940)			Cincinnati ..	..	453
New York ..	..	7400	Newark ..	..	440
Chicago ..	..	3390	Kansas City ..	..	400
Philadelphia ..	..	1933	Seattle ..	..	365
Detroit ..	..	1620	Indianapolis ..	..	364
Los Angeles ..	..	1500	And about 50 other towns		
Cleveland ..	..	878	with more than 100,000		
			inhabitants.		

NORTH AMERICA

COUNTRY	NATURE OF GOVERNMENT	AREA SQ. MILES	POPULATION MILLIONS	CAPITAL	POPULATION THOUSANDS	CHIEF EXPORTS	CHIEF IMPORTS
Dominion of Canada	Self-govern- ing British Dominion	3,695,000	11½	Ottawa	155	Automobiles and parts, wheat, news- print, meat, wood- pulp	Machinery, coal, automobile parts, textiles, petroleum
Newfound- land*	Self-govern- ing British Dominion	43,000	0.3	St. John's	55	Fish (chiefly cod), iron ore, wood pulp, paper	Textiles, flour, coal
United States of America	Federal Re- public	3,600,000 (including Alaska, 590,000)	132	Washington	663	Raw cotton, wheat, meat, dairy pro- duce, iron, steel, and copper manu- factures, mineral oils, wood	Sugar, skins, coffee, silk and cotton goods, raw wool, rubber, hemp
Mexico	Federal Re- public	767,000	20	Mexico	1500	Petroleum, silver, copper, henequen (hemp)	Textiles, machinery, coal

* Labrador, 232,000 sq. miles, population 5,000, is governed by Newfoundland.

THE WEST INDIES

	AREA SQ. MILES	POPULATION THOUSANDS	CAPITAL	POPULATION THOUSANDS	LEADING PRODUCTIONS
Cuba	44,000	4200	Havana	569	tobacco, sugar, cocoa
Haiti	10,000	2500	Port-au-Prince	125	coffee, cocoa, cotton
Santo Domingo	19,000	1600	Ciudad Trujillo	71	cocoa, sugar, tobacco
Porto Rico (U.S.A.)	3400	1900	San Juan	165	sugar, coffee, tobacco
BRITISH WEST INDIES:					
Bahamas	4400	70	Nassau	15	sponges, fruit, hemp
Barbados	166	200	Bridgetown	14	sugar, molasses, rum
Jamaica	4600	1200	Kingston	90	bananas, sugar, rum, coffee
Leeward Islands	420	100	St. John (Antigua)	8	sugar, lime-juice
Windward Islands	800	270	St. George's (Grenada)	5	cocoa, sugar
Trinidad and Tobago	2000	500	Port of Spain	95	cocoa, sugar, pitch, petro- leum
FRENCH WEST INDIES:					
Guadeloupe	650	300	Basse-Terre	12	sugar, coffee
Martinique	380	250	Fort-de-France	50	sugar, cocoa

QUESTIONS ON CHAPTER XIII

1. Name three Canadian rivers which flow respectively into the Atlantic, the Arctic, and the Pacific. Describe briefly the nature of the country traversed by each—as mountain or plain, forest, grassland, or desert. Place these rivers in the order of their usefulness for navigation, and give reasons for the order in which you place them.

2. Draw a sketch-map of the coast from the Bay of Fundy to the Mississippi delta; with the island of Cuba and the Bahamas. Mark the Appalachian Mountains and the rivers Delaware, Hudson, Mohawk, Potomac; also Baltimore, Boston, Chesapeake Bay, Havana, Key West, Louisiana, New Orleans, Pennsylvania.

3. What part of Canada is the most suitable on climatic grounds for settlers from the West of Ireland? Why has this part of Canada so different a climate from that of the rest of the Dominion?

4. State (i) what natural advantages made San Francisco the great port of the western United States; and (ii) in what regions of North America the following commodities are produced in large quantities: tobacco, timber, wheat, cheese, silver.

5. On the given map (Canada) mark Mt. McKinley, the Selkirk Range; Lake Winnipeg; the Saskatchewan and Nelson rivers; Great Bear Lake, Lake Erie, the Bay of Fundy, Queen Charlotte Island, Cape Race; Dawson City, Port Arthur, Niagara, St. John's, Sault Ste. Marie; and draw the outline of British Columbia.

6. (i) State what are the chief industries of Mexico, and who are its inhabitants.

(ii) State which parts of North America produce bananas, cotton, silver, nickel.

7. (i) State the position of the great wheat-lands of Canada, and how the grain travels to Europe.

(ii) Give the situation of St. Louis and of New Orleans, and explain how the situation of each town determined its leading industry.

(iii) Name two chief products of Cuba, and two of Trinidad.

8. Name the rivers shown in Fig. 60.

9. A person leaves New Orleans and travels by way of Lake Superior to Hudson Bay. Note the changes in man's occupations he would meet with region by region.

10. Describe the country passed through on a railway journey from New York to San Francisco via Chicago.

11. Draw sketch-maps to show the position of (a) either Winnipeg or Montreal; (b) either New York or Chicago. Account for the importance of the towns you select.

CHAPTER XIV

CENTRAL AND SOUTH AMERICA

I. CENTRAL AMERICA

335. Central America (Fig. 64) is geographically that narrow part of the continent which lies between the Isthmus of Tehuantepec and the Isthmus of Panama. Politically, Central America is in seven divisions—the colony of British Honduras, and the six independent republics of Guatemala, Salvador, Honduras, Nicaragua, Costa Rica, and Panama.

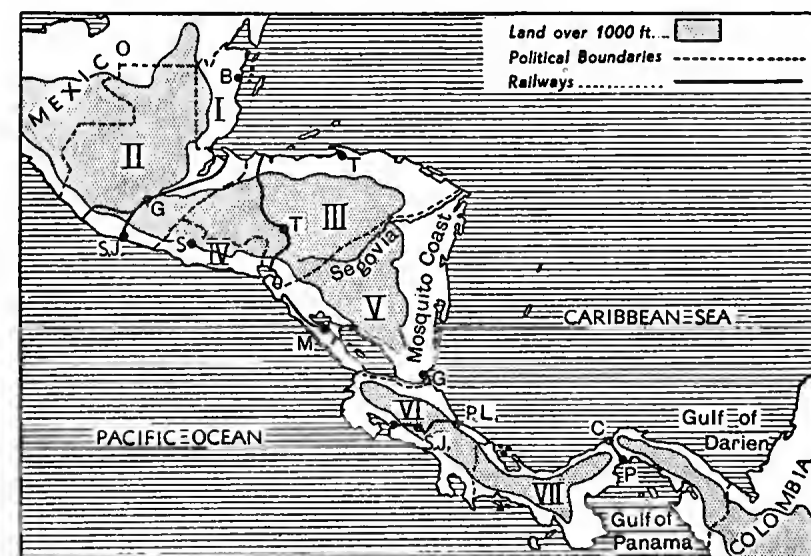


Fig. 64. CENTRAL AMERICA.

The smallest of these, Salvador, is about the size of Wales; the largest, Nicaragua, is nearly as large as England.

336. Central America as a whole is very mountainous, especially on the Pacific side; the Atlantic side has fairly wide coast plains. These plains are very hot and unhealthy, and a great majority of the white population, who are mainly of Spanish descent, live in the highlands near the Pacific coast.

The east coast of Nicaragua is called the Mosquito Coast, from the name of a tribe of Indians living there.

There are many active volcanoes in the mountains, some in Guatemala rising over 13,000 feet, and in Costa Rica over 11,000 feet. As the main watershed is near the Pacific, the longer rivers flow to the Atlantic. The longest of them is the *Coco* or *Segovia* River, in the north of Nicaragua. In the south and west of the same state there is a wide low trough containing Lakes Managua and Nicaragua and the navigable *San Juan* River, which drains them.

It was at one time proposed to cut a ship-canal across the continent, by way of the *San Juan* river (separating Nicaragua from Costa Rica) and Lake Nicaragua, but this scheme was abandoned, and the Canal was cut through the Isthmus of Panama (Art. 339).

337. The hot, wet, lowland, the *tierra caliente* or hot zone, is forested, and produces rubber, mahogany, and other valuable woods, bananas, and cacao. In the cooler and drier uplands, from about 2,000 to 6,000 feet, the *tierra templada*, or temperate zone, coffee and maize are the chief products. Higher still, from about 6,000 to 10,000 feet, in the *tierra fria* or cold region, wheat, beans, and potatoes are cultivated, and cattle and sheep are reared.*

338. The chief exports of Central America are coffee, mainly from Guatemala and Costa Rica, bananas, mahogany, and dyewoods from the Atlantic coast plains, and indigo from Salvador.

The table at the end of the chapter gives particulars of the states of Central America and their capitals. These towns are all, except Panama, high inland towns, nearer the Pacific than the Atlantic. The largest town, Guatemala, was completely destroyed by earthquake in 1917, but has been rebuilt. Salvador is much the most densely populated state, with nearly 150 people per square mile. Most of the people of Central America are Indians or half-breeds, with a considerable number of negroes. The whites are mainly of Spanish origin.

* The above terms, *tierra caliente*, *templada*, *fria*, are used in Mexico and northern South America, as well as in Central America, to denote the succession of belts of vegetation found on tropical mountain slopes.

Central America is crossed by three railways, in Guatemala, Costa Rica, and Panama (Fig. 64). On the whole the region is very backward and unprogressive, and the inhabitants are imperfectly civilised.

All the Central American states except British Honduras and Salvador possess coast-lines on both the Atlantic and the Pacific.

THE PANAMA CANAL

339. The United States government has purchased from the Republic of Panama a strip of land ten miles wide across the Isthmus of Panama, from Colon on the Atlantic to Panama on the Pacific, and has connected the two oceans by the construction of a great ship-canal, which was opened for traffic in 1914. The canal is 46 miles long and 40 feet deep, and rises by locks to a summit-level of about 80 feet above sea-level.

The canal greatly increases the naval power of the United States, by enabling it to bring together quickly, on either side of the continent, its Atlantic and Pacific fleets, which previously, to effect a junction, had to execute the very long voyage round South America.

The canal is important commercially.

(i) It brings both Europe and eastern U.S.A. into closer connection by sea with the Pacific ports of both North and South America, and should stimulate the trade of those ports. From Liverpool to San Francisco the saving of distance is over 6,000 miles.

(ii) The distance from New York to the "Far East" (China and Japan) is greatly reduced by the Panama Canal, and made about equal to the distance from England to the Far East by the Suez Canal route. Thus the great manufacturing region of U.S.A. (the north-east) is placed more or less on an equality with England and western Europe generally, in competition for the important trade with China and Japan.

(iii) The route from English ports to New Zealand is about 700 miles shorter via Panama than via Suez.

(iv) The West Indies, and especially Jamaica, will probably increase in commercial importance by being placed on a highway of ocean commerce instead of in a *cul-de-sac*.

The United States government, by stringent sanitary precautions and immense sanitation works, has enormously improved the health of the canal zone from Colon to Panama, and has stamped out yellow fever, previously the great scourge of this region. It was mainly this disease which caused the abandonment of a previous attempt (under French engineers) to cut the canal, in 1881 and following years.

2. SOUTH AMERICA

GENERAL

340. South America is about seven million square miles in area, a little less than twice Europe. It lies a good deal farther east than North America, its *west* coast lying mainly between 70° and 80° W., which is about the same longitude as the *east* coast of the United States.

The greatest length of the continent is nearly bisected by the Tropic of Capricorn, and the widest part lies between the tropic and the equator. The extreme points are Punta Gallinas in the north, Cape Horn (56° S.) (*not* on the mainland) in the south, Punta Parina in the west, and Cape Branco in the east. The distance from Cape Branco to the nearest point of the African coast is only about 1,600 miles, and Brazil was first sighted accidentally by Europeans in the course of a voyage to South Africa.

COASTS

341. South America has less coast line in proportion to its area than any other continent except Africa. The coast is very unindented except to the south of lat. 40° S. Here there are wide bays on the east, and a cliff-bound fjord coast, with many small islands, on the west.

One of the fjords in the south penetrates right across the continent, forming the narrow, winding Magellan Strait, between Patagonia and the large island of Tierra del Fuego. Cape Horn is on an islet to the south of this. The southern extremity of South America is a very stormy inhospitable region, with driving mists and snow during a large part of the year.

The west coast, north of lat. 40° S., is generally high and steep, with very few good harbours and no considerable

openings except the Gulf of Guayaquil. The north coast, most of which is also steep and rugged, has two large openings, the Gulf of Darien and the Gulf of Venezuela, which is continued southward in the large lagoon of Maracaibo. Large ships cannot enter this lagoon, as there is a bar at the mouth only six or seven feet below the surface.

Most of the east coast is low and shelving, often with vegetation descending to the water's edge. But in the neighbourhood of the Tropic of Capricorn the Highlands of Brazil approach close to the sea, and provide in the bay of Rio de Janeiro the best natural harbour in the continent. In the south of Brazil there is the great lagoon of Patos, separated from the sea by a long sand-bar.

LAND RELIEF

342. South America may roughly be said to consist of three highland regions, *i.e.* the Andes, the Highlands of Guiana, and the Brazilian Highlands; and three lowlands, the Llanos of the Orinoco, the Selvas of the Amazon, and the Pampas of the Parana. These lowland areas are almost continuous with one another.

The Andes form the longest unbroken mountain chain in the world. From about 5° N. to 40° S. the lowest passes are over 11,000 feet high.

The north of the Andes system, in Colombia, consists of four ranges with deep longitudinal valleys between them. The easternmost range is prolonged along the north coast as the Venezuelan Range. The link between this and the Andes is the Sierra Merida, just south of Lake Maracaibo.

Ecuador contains the narrowest part of the Andes system, a very complicated highland "knot" containing the great volcanic peaks of Chimborazo (20,500 feet) and Cotopaxi (19,500 feet). Fig. 65 is a diagram of the Andes of Ecuador. The ranges, shown by thick black lines, are generally from 12,000 to 15,000 feet high, while the intermont plains are about 8,000 feet. It will be noticed that most of the rivers flow to the Pacific, the eastern range being almost unbroken.

The central Andes of Peru, Bolivia, and northern Chile contain two main ranges, east and west, separated by a lofty plateau which has its greatest width in the *Plateau of Bolivia*, a basin of inland drainage containing the only large lakes in

South America—Lake Titicaca, from which a river flows to Lake Aullagas, which has no outlet. The Bolivian Plateau is on the average about 12,000 feet high, and except Tibet is the highest inhabited region in the world. On its north-eastern edge are the mountains Sorata and Illimani, both about 21,000 feet high; and on the opposite side, nearly due south of these, is Sahama.

The main eastern and western ranges unite near Aconcagua (23,000 feet), the highest mountain in South America (Fig. 67). South of this is a single range, which becomes lower and more broken beyond lat. 40°, where its lower valleys have become fjords, and its outlying spurs islands—Chiloe Island, the Chonos Archipelago, Wellington Island, etc.

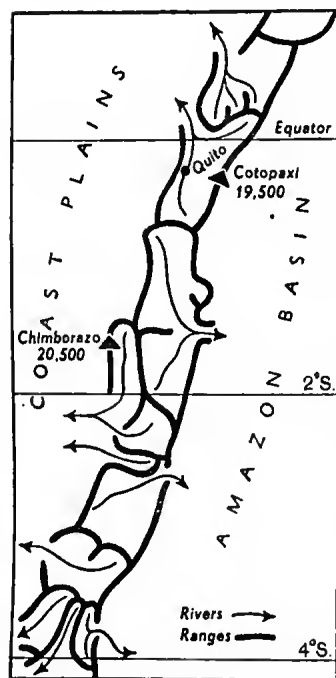


Fig. 65.
THE ANDES OF ECUADOR.

of the Brazilian Highlands to the north-west is called the Plateau of *Matto Grosso*.

Over 40 per cent. of the area of South America is less than 600 feet in height—a proportion only exceeded in Europe.

RIVERS

344. The Andes are so near the west coast and form such a continuous watershed that the Pacific rivers of South

America are small and unimportant. The continent is drained almost exclusively towards the Atlantic.

The Magdalena and its tributary the Cauca flow northward through parallel valleys of the Colombian Andes into the Caribbean Sea.

The Orinoco (1,200 miles) flows in a semi-circular course round the west side of the Guiana Highlands, and enters the sea, opposite Trinidad, through a large thickly-wooded delta. Its principal tributary, the Meta, comes from the Andes. The upper Orinoco divides into two branches, one flowing northward as the Orinoco, the other, the Cassiquiare, flowing southward into the Rio Negro, a tributary of the Amazon. Thus the Cassiquiare is a natural canal between the Orinoco and the Amazon.

Several parallel rivers flow northward through Guiana. The largest of them is the Essequibo, which bisects British Guiana. The Demerara, near and parallel to it, has a name famous in connexion with sugar, which is the most important product of Guiana.

345. The Amazon (4,000 miles) is not the longest river of the world, but is greatest in the volume of water it carries, and also in the area of its basin, which is nearly one-third of the whole continent.

The head waters of the Amazon are on the Peruvian Plateau, where two large streams, the Marañon and Ucayali, flow northward and then break through the eastern range and unite at the edge of the great plain of the lower river. The Marañon is generally taken as the main stream. The point where the Ucayali joins it is 1,800 miles from the sea, but only about 350 feet above sea-level. Thus the current of the lower river is very slow. The main stream is wholly south of the equator, which it reaches at the mouth. There is a large island-studded estuary with powerful tidal bores; the tide advances 500 miles up the river, while the ocean is discoloured and freshened by the waters of the river 200 miles from its mouth. Large ocean-going ships can reach Manaos, about 1,000 miles inland, and smaller vessels go up to Iquitos in Peru.

A branch from the head of the estuary leads south of the large island of Marajo into the Para mouth of the river, which is the one chiefly used by shipping. It is really the

mouth of the river Tocantins, flowing north from the Brazilian Highlands.

Some of the southern tributaries of the Amazon are larger than any European river. On the north side the chief tributaries are the Yapura and Rio Negro. The connection of the latter with the Orinoco has been already mentioned (Art. 344). On the south side the chief tributaries are the Purus, Madeira, Tapajos, and Xingu. The largest of these is the Madeira, which is navigable almost throughout its whole length, except for some falls and rapids about 10° S. The source of the Guapore, an upper tributary of the Madeira, is within four miles of one of the sources of the Paraguay, and the two rivers are often connected by floods. Thus the Amazon has not only a permanent connexion with the Orinoco, but an intermittent connexion with the Rio de la Plata.

346. The Rio de la Plata or "River Plate" is a large estuary which receives the waters of the Uruguay and the Parana (2,000 miles). These rivers rise near the sea in the Brazilian Highlands, and flow in roughly parallel courses west and then south to their common estuary. The chief tributary of the Parana is the Paraguay, flowing nearly due south from Matto Grosso. It is joined by the Pilcomayo and Bermejo from the Bolivian Andes. The parallel river Salado joins the Parana farther south. The Paraguay is navigable almost to its source, but the Parana only for a short distance above its confluence with the Paraguay.

The chief river of eastern Brazil is the *São Francisco*, which is navigable for a long distance, and is connected with the Tocantins by another of those natural canals which are a remarkable feature of South America.

South of the Rio de la Plata the chief rivers are the Colorado, Negro, and Chubut. To the north of the first of these is an area of the Pampas which has no outlet to the sea. The Rio Negro is the only one of these southern rivers that is navigable.

CLIMATE

347. The widest part of South America is in the region of south-east trade winds, which produce at all seasons a heavy rainfall on the Brazilian Highlands, and on the whole east coast from Cape San Roque to the Rio de la Plata,

The Amazon basin is mostly in the region of heavy equatorial rain. In the northern summer (July) the heaviest rain is on the north of the river, while Matto Grosso and central Brazil generally are rather dry. In the northern winter the heaviest rain is south of the equator, especially in the basin of the Madeira.

The extreme north of the continent receives heavy rain from the north-east trade winds, especially in summer.

The western slope of the Andes, from the equator to about 30° S., is a very dry region, in parts almost absolutely rainless, lying in the "rain-shadow" of the Andes. These form an insuperable barrier to the influence of the trade winds, which produce heavy rainfall on the eastern slope.

Beyond about lat. 35° S. these conditions are reversed. The southern extremity of the continent is in the belt of "Brave West Winds," and the western slope of the mountains has a heavy rainfall, while the eastern slope (Patagonia) is very dry.

348. A small area in central Chile, around Valparaiso and Santiago, has a climate of the Mediterranean type, with winter rain. This region is in winter (July) just on the northern edge of the zone of west winds, and therefore receives rain at that season, while in the southern summer it is in the calms of Capricorn. Its situation and climate are similar to those of the Californian Valley in North America, and to the region round Cape Town in South Africa, or Adelaide in South Australia.

There are no very great extremes of temperature in South America, except, of course, on the Andes, which rise beyond the snow-line even in the equatorial belt. Temperatures diminish fairly uniformly from north to south during the northern summer, when the average temperature north of the Amazon is about 80° and that of Cape Horn is approximately at the freezing point (32°). In the southern summer eastern Brazil and the northern Argentine are the hottest parts of the continent. There is no climate of the extreme "continental" type such as is found in all the northern continents.

The cold Humboldt current flowing north along the west coast (Art. 68) and the warm Brazil current flowing south along the east coast (Art. 66) have the effect of making the

west coast, south of the equator, distinctly cooler than the east coast in similar latitudes. In the following table Antofagasta and Rio de Janeiro are in almost exactly the same latitude.

The table gives average monthly temperatures and rainfall for six typical places: Caracas and Rio de Janeiro, trade wind climates on east coasts; Para, equatorial lowland; Quito, equatorial highland; Valparaiso, "Mediterranean" climate; and Antofagasta, tropical desert.

AVERAGE TEMPERATURE: ° F.

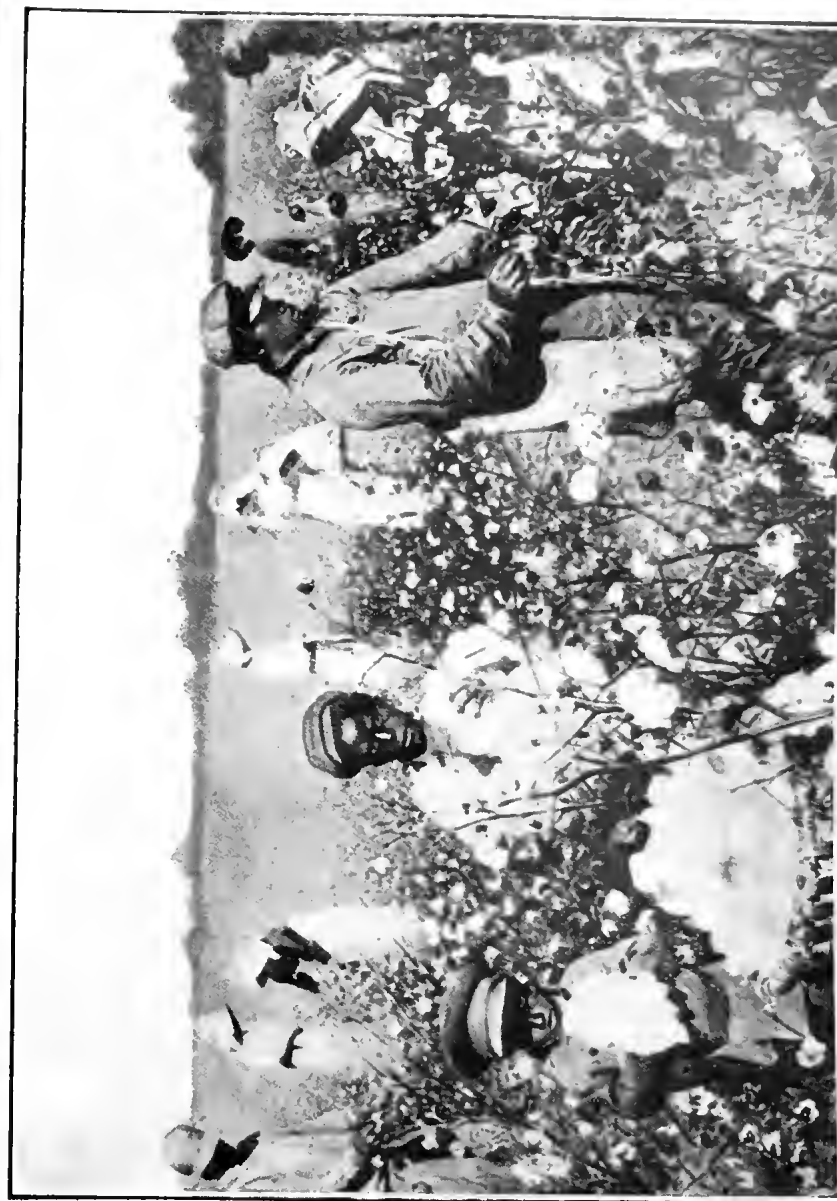
DISTRICT	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Caracas (2000 ft.)	66	67	68	70	71	70	69	69	70	70	69	67
Para ..	78	77	78	78	79	79	78	79	79	79	80	79
Rio de Janeiro	78	78	77	75	71	69	68	69	70	71	73	76
Valparaiso ..	67	66	65	61	59	56	55	56	58	59	62	64
Antofagasta	72	70	70	67	64	63	62	60	61	62	64	68
Quito (9300 ft.)	54	55	54	54	55	55	55	55	55	55	54	55

AVERAGE RAINFALL: INCHES

DISTRICT	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Caracas (2000 ft.)	.4	.4	.5	1.1	2.9	4.2	4.8	4.0	3.9	3.8	3.3	1.6
Para ..	12.5	14.1	14.1	12.6	10.2	6.7	5.9	4.4	3.5	3.3	2.6	6.1
Rio de Janeiro	5.0	4.3	5.5	4.2	3.3	2.2	1.7	1.8	2.6	3.3	4.1	5.5
Valparaiso ..	—	—	.6	.2	3.5	5.8	4.8	3.2	.8	.4	.1	.3
Antofagasta	—	—	—	—	—	—	.1	—	—	—	—	—
Quito (9300 ft.)	4.2	4.0	5.3	7.3	5.1	1.5	.9	1.5	2.9	3.7	3.7	3.9

VEGETATION AND ANIMALS

349. The Amazon basin, with its heavy rainfall and constant high temperature, is almost completely covered with dense tropical forest, called the *selvas*. This region is almost impenetrable on account of the luxuriant undergrowth. Vegetation comes right down to the banks of the rivers, and large areas of the forest are flooded in the rainy season.



Exclusive News Agency.

NEGROES PICKING COTTON, SOUTHERN U.S.A.

Cotton seeds (from which oil is obtained) are enclosed in the white clusters of fibre, and have to be separated before the fibre can be used.

There are many rare and brilliant orchids, and the giant water-lily, *Victoria regia*, is common. The rivers form the only easy routes through the selvas, and considerable areas are still unexplored, and inhabited only by savage Indians.

The most important commercial product of the selvas was formerly india-rubber, the solidified juice or sap obtained by cutting the bark of a variety of trees, of which the most important is called *Hevea Braziliensis*. It grows wild in the Amazon forests, widely scattered among other trees. The immense demand for rubber due to the motor industry has led to large areas in Malaya (British and Dutch) and Ceylon being planted with rubber trees. The Asiatic plantations now produce about ninety per cent. of the world's rubber, and the "wild" rubber of Brazil is comparatively unimportant. The best quality rubber, even when it comes from Asia, is, however, still known commercially as "Para" rubber, from the original port of shipment of Brazilian rubber. Rubber plantations have been made in Brazil, but have not so far been able to compete very successfully with Malaya and Ceylon, which have a better supply of labour.

The selvas also produce Brazil nuts, various kinds of timber, including valuable cabinet woods and dyewoods, and medicinal plants, *e.g.* cinchona ("Peruvian bark") from which quinine is made. This plant also, like rubber, is now more grown in Asia (Java, Ceylon) than in its original home.

The delta of the Orinoco is forested and very swampy, but most of the basin of the river consists of open park-like plains with scattered clumps of trees. These plains are called the llanos, and form excellent pasture land, but are at present of little importance.

In southern Brazil, Uruguay, and the middle of the Argentine, there are vast treeless plains of rich grassland, called *pampas*, admirably adapted for rearing cattle and sheep, and now, like the prairies of North America, being more and more turned into arable land, and raising great crops of wheat, maize, and oil-seeds. The western pampas, however, are too dry for agriculture, and contain an area called *Las Salinas*, or the Salt Desert, which is quite unproductive.

To the north-west of the pampas, between the river Paraguay and the Andes, is a sub-tropical region of open forest (chiefly palms) called *El Gran Chaco*, or "the great hunting ground."

The south of the Argentine (Patagonia) is a bleak, unproductive region of bare steppes, fit for little but sheep pasture. Part of it is occupied by the *Shingle Desert*, a stony plain thinly covered with dwarf scrub.

350. The Andes exhibit at different elevations every variety of vegetation from tropical to arctic. The temperate middle slopes and the plateaus of Bolivia and Peru produce maize and wheat, while coffee is grown at a lower level. The lowlands of Ecuador produce large quantities of cocoa, which is the chief export of that country.

The coast plains of southern Peru and northern Chile are almost completely rainless, and can only be cultivated near the short rivers, where cotton, coffee, and sugar are grown. The most sterile part of this region, round the Tropic of Capricorn, is called the *Atacama Desert*.

The narrow region of central Chile, between the coast and the Andes, like other countries with the Mediterranean type of climate, grows wheat and the vine, and it also has fertile pasture lands.

The inland republic of Paraguay, on the southern limit of tropical forests, produces oranges and *yerba maté*, or Paraguay tea, a beverage largely used throughout South America in place of ordinary tea.

In Brazil there are two separate areas which have considerable agricultural productions. The lower basin of the São Francisco and the coast plains between Pernambuco and Bahia produce cotton, cocoa, sugar, and tobacco. The coast ranges just north of the tropic, at the back of Rio de Janeiro and Santos, are the greatest coffee-growing region in the world. The coffee goes mainly to the United States.

Fig. 66 shows the chief economic products of South America.

The native animals of South America include many forms peculiar to that continent, such as the jaguar and puma, the American representatives of the tiger and lion, the tapir, armadillo, and sloth; many kinds of monkeys; the rhea, a kind of ostrich; the alpaca, llama, and vicuña, animals peculiar to the Andean plateaux, and producing valuable kinds of wool.

The tropical rivers swarm with alligators and other dangerous reptiles, and fish; and South America contains the largest snakes (boa-constrictor and anaconda). There is an



Fig. 66. SOUTH AMERICA (PRODUCTS).

immense variety of birds remarkable for their gorgeous plumage, from parrots down to humming birds scarcely larger than a bee.

Cattle, horses, and sheep have been imported, and have increased to enormous numbers, especially on the pampas. The export of meat (chilled, frozen, or canned), and of meat extracts from the pampas is an important industry.

MINERALS

351. South America is rich in valuable minerals, but very poor in coal and iron, so that there is little likelihood of its becoming an important manufacturing region. The minerals are chiefly found in the mountainous parts.

Colombia exports precious stones, particularly emeralds, and platinum. Peru and Bolivia are especially rich in silver, and the latter state is now one of the principal sources of tin. Large deposits of nitrate of soda, a valuable manure, are found in the Atacama Desert. A little farther south the Chilean Andes, behind Copiapo and Coquimbo, are rich in copper, in the production of which Chile is only exceeded by the United States. The chief gold mines of the continent are in British Guiana and southern Venezuela. Diamonds are mined in eastern Brazil, in the province of Minas Geraes, where gold is also found.

OCCUPATIONS, INDUSTRIES, AND TOWNS

(1) Andean Countries

352. The western countries of South America are at present of little commercial importance, and with the exception of Chile are in a very primitive and undeveloped condition.

Colombia, alone among the Andean countries, has the advantage of an Atlantic coast-line and of rivers, the Magdalena and Cauca, navigable for some distance into the interior. Its chief seaport is Barranquilla, at the mouth of the river. This has grown at the expense of Cartagena, which has a better harbour, but no easy routes inland. The capital, Bogota, is far inland, 9,000 feet high on the easternmost range of the Andes. It therefore has a temperate climate, though within about 5° of the equator.

Quito, the capital of Ecuador, is at about the same elevation, almost on the equator, and near Cotopaxi (Fig. 65). Its temperature all the year round is like that of an English spring. Strangers experience some difficulty in breathing at places like Quito, on account of the rarefied state of the atmosphere. The port of Ecuador is Guayaquil, at the head of the Gulf of Guayaquil. It exports cocoa and "Panama" hats, so called because they are exported through Panama.

The chief seaport of Peru is Callao, from which the capital, Lima, is only about five miles inland. It exports cotton, wool (alpaca and llama), petroleum, and sugar. Cerro de Pasco is a silver-mining centre high up in the Andes (14,270 feet). Cuzco was the capital of the Empire of the Incas of Peru till the Spanish conquest. Puno is a port on the north side of Lake Titicaca, and is connected by rail with the seaport of Mollendo.

353. Bolivia is an entirely inland country, which conducts its commerce (tin, silver, rubber) through the Chilean ports of Arica and Antofagasta. The output of tin is, after that of the Straits Settlements, the largest in the world. La Paz is the largest town and the chief commercial centre. Potosi had enormously rich silver mines, and though these are now almost worked out the district round is rich in silver ore.

The nitrate of soda found in the Atacama Desert is exported chiefly from Iquique. The port of the copper-mining district farther south is Coquimbo.

The capital of Chile, Santiago, is in a long fertile valley, called the Central Valley of Chile, lying between the low coast range and the Andes. It has probably the best climate of any part of South America, resembling that of California. Wheat, fruit, and wool are largely produced. The port of Santiago, and the most important seaport in western South America, is Valparaiso, which was almost destroyed by earthquake in 1906.

Concepcion and Valdivia are the chief seaports for the districts south of Santiago. Chile possesses the most southerly town in the world in Punta Arenas, a port of call for ships passing through Magellan Strait.

The chief towns of Chile are shown in Fig. 67.

(2) Brazil, Guiana, Venezuela

354. The chief towns of Venezuela are Caracas, the capital, and Valencia, both situated high up in the Coast Range, and connected by mountain railways with their ports of La Guayra and Puerto Cabello, which export chiefly coffee. The only town on the Orinoco is Ciudad Bolivar, trading in cattle and hides.

Georgetown, Paramaribo, and Cayenne are the capitals and seaports of the British, Dutch, and French colonies of Guiana respectively. Georgetown, at the mouth of the Demerara, is the largest and most important of the three. Its chief export is sugar, with some gold. Cayenne is chiefly used as a convict station.

The main outlet of the Amazon basin is Para, on the southern or Tocantins mouth of the river. It trades in rubber and other forest products (timber, nuts, etc.). The only inland town of any consequence is Manaus, a river-port and collecting centre near the junction of the Rio Negro with the Amazon. Maranhão and Ceara, east of the Amazon mouth, deal in the same products as Para, but on a smaller scale.

Pernambuco (Recife), the most easterly town in the continent, and Bahia are the ports and commercial centres of the cultivated country, producing sugar, cotton, and tobacco, round the lower São Francisco.

Rio de Janeiro, just north of the tropic, on the best natural harbour of the east coast, is the capital of Brazil, and the chief outlet for the great coffee-growing region of the Brazilian Highlands. São Paulo is a large inland centre of coffee plantations, connected with the port of Santos. Ouro Preto is the chief town of the mining and agricultural state of Minas Geraes (Fig. 67).

The extreme south of Brazil is really part of the pampas, and is mainly occupied in cattle-rearing, exporting meat, tallow, and hides. The chief towns are Porto Alegre, at the head of the lagoon of Patos, and Rio Grande do Sul, at the entrance of the lagoon.

(3) The River Plate Region

355. The pampas are rapidly increasing in productions and commercial importance, and are the only part of South America that attracts considerable numbers of immigrants, chiefly Italians.

Uruguay and the Argentine province of Entre Rios, between the Uruguay and the Parana, are especially suitable for cattle, and export great quantities of meat, live and dead, meat essences, hides, and tallow. In the rest of the Argentine sheep are as important as cattle, and much more important towards the west and south, where there is less rainfall. Hence wool is one of the chief exports. It goes mainly to the manufacturing regions of western Europe, particularly France and Germany. An increasing amount of pasture round the lower Parana is being turned into arable land, and there is a large export of wheat, maize, and linseed.

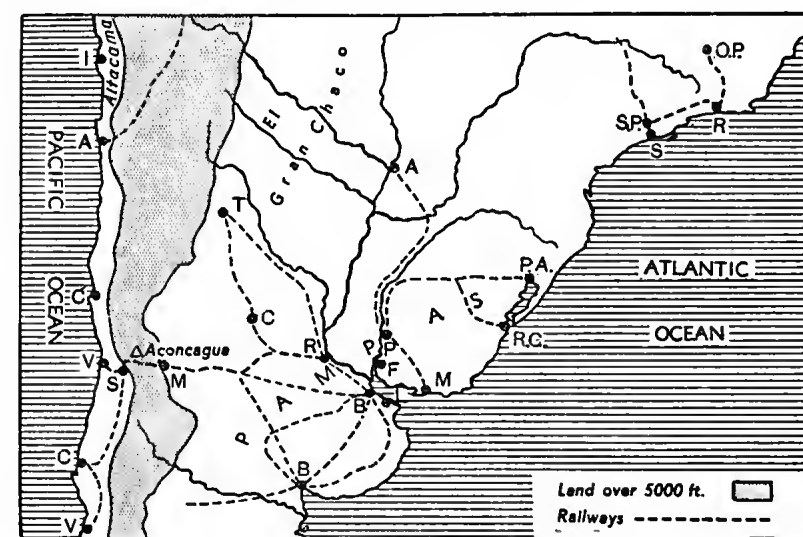


Fig. 67. SOUTH AMERICA FROM 20°S. TO 40°S.

Buenos Aires, capital of the Argentine, is the largest town in the southern hemisphere, having a population of over two millions. Its harbour is naturally a bad one, but has been improved at great expense. Lower down the estuary is the growing port of La Plata. On the other side of the river is Montevideo, the capital and only large town of Uruguay. Rosario is the second large town of Argentina, a great river-port and railway centre, about 150 miles up the Parana. Córdoba is in the drier western pampas, and Mendoza is among the foot-hills of the Andes, in the extreme west of Argentina. Tucumán is the capital of a sub-tropical

sugar-growing district in the north. Bahia Blanca is a port of growing importance in the southern pampas, a little north of the Rio Colorado, and has large exports of wool and wheat.

The small towns of Fray Bentos and Paysandu in Uruguay are famous for their production of tinned meat and meat essences.

Asuncion, at the junction of the Paraguay and Pilcomayo, is the capital and only important town of the backward and unprogressive republic of Paraguay.

Fig. 67 shows the principal towns of the River Plate region.

(4) Islands

356. The Falkland Islands are a British colony about 300 miles east of Magellan Strait. The total area is about equal to that of Yorkshire, and the inhabitants number only 2,000. The capital is Stanley. The only industry is sheep-farming, and the exports are wool, skins, and mutton. The islands serve as a base for whaling ships in the Antarctic. The climate is very bleak and stormy.

The Galapagos Islands are a volcanic group on the equator, about 700 miles west of Ecuador, to which they belong. The area is 2,400 square miles, and the population about 400. The islands are quite unimportant commercially, but are interesting geographically, because they contain a great number of species of animals and plants found nowhere else in the world. They are also the coolest equatorial lowland, owing to their position in the cold Humboldt or Peru current.

RAILWAYS

357. Argentina is the only part of South America that has a large system of railways more or less covering all the productive parts of the country. A considerable number of lines (more than are shown in Fig. 67) radiate from Buenos Aires, and reach the frontier in the west and in the north. Bahia Blanca and Rosario are secondary railway centres. The main western line from Buenos Aires is the only trans-continental railway in South America. It crosses the Andes by a long tunnel (12,000 feet high) through the Uspallata Pass, just south of Aconcagua, and connects Buenos Aires with Santiago and Valparaiso.

In Chile a railway runs south through the Central Valley from the capital to Concepcion and Valdivia.

There are two small railway systems in Brazil, running inland for short distances from (a) Santos and Rio de Janeiro (Fig. 67), (b) Bahia and Pernambuco.

On the west and north coast of the continent there are several short mountain railways, some of which are remarkable feats of engineering. Thus Oruro and La Paz, on the Bolivian Plateau, are connected with the coast at Antofagasta and Arica respectively. In southern Peru a line joins Mollendo through Arequipa with Puno, on Lake Titicaca. The silver mines of Cerro de Pasco are connected with Lima by a line which reaches a height of 15,000 feet. There is a railway from Quito to the coast opposite Guayaquil. In Venezuela the railway from La Guayra has to make a *détour* of over 20 miles to reach the capital, which is only six miles from the port.

POLITICAL DIVISIONS AND POPULATION

358. South America contains the three European colonies of Guiana in the north-east, while the rest of the continent consists of ten independent republics, four on the Pacific, four on the Atlantic, and two inland. Revolutions and boundary disputes are of frequent occurrence among the minor republics, which are in a very backward and unsettled condition. The strongest and most progressive states are Argentina, Chile, and Brazil.

The total population is probably about sixty-four millions (about the same as that of Germany), and is of a very mixed character. The original inhabitants were "Red Indians" of many different races. The most civilised of them were Peruvians. The European conquerors in the sixteenth century were Spanish, except in the case of Brazil, which was conquered by the Portuguese. All the Spanish and Portuguese colonies in South America revolted and became independent early in the nineteenth century. Brazil preserved monarchical government under an Emperor till 1889, when it became a republic like the others.

During the three centuries of European dominion many negro slaves were introduced, and negroes are now common in Brazil and Guiana. Only about a quarter of the population of the continent is pure white, the remainder being mostly

people of mixed breeds. The pure Indians that survive are mostly quite uncivilised tribes in the forest regions. Chile is the most Spanish country in South America. Large numbers of Italians have emigrated to Argentina, and Germans to the south of Brazil. There are many Hindu coolies in British Guiana. Commercial affairs and engineering works throughout the continent are largely in the hands of Englishmen, Americans (U.S.A.), and Germans.

CENTRAL AMERICA

COUNTRY	AREA SQ. MILES	POPULATION MILLIONS	CAPITAL	POPULATION THOUSANDS	
British Honduras	8,500	·05	Belize	16	Exports: bananas and coffee Imports: textiles and foodstuffs
Guatemala ..	42,000	3·0	Guatemala	180	
Honduras ..	44,000	1·0	Tegucigalpa	50	
Salvador ..	13,000	1·9	San Salvador	100	
Nicaragua ..	52,000	·75	Managua	75	
Costa Rica ..	23,000	·45	San José	75	
Panama ..	32,000	·45	Panama	100	

SOUTH AMERICA

	AREA Sq. Miles	POPULATION MILLIONS	CAPITAL	POPULATION THOUSANDS	CHIEF PRODUCTIONS
Colombia	8·0	Bogotá	390	Coffee, wheat, rice, gold, silver
Ecuador	3·0	Quito	150	Cocoa, quinine, rubber, gold
Peru	7·0	Lima	500	Cotton, coffee, sugar, wool, guano, copper, petroleum
Bolivia	3·0	La Paz	200	Cereals, rubber, silver, tin
Chile	4·5	Santiago	712	Nitrate, copper, cereals, wine
Argentine Republic	..	13	Buenos Aires	2400	Wool, wheat, maize, meat, hides
Uruguay	2·0	Montevideo	750	Meat, wool, cereals
Paraguay	1·0	Asuncion	100	Maté, oranges, timber, tobacco
Brazil	42	Rio de Janeiro	1800	Coffee, sugar, cotton, tobacco, timber, nuts, cocoa, meat, leather
French Guiana	..	·04	Cayenne	13	Gold, cocoa
Dutch Guiana (Surinam)	..	·1	Paramaribo	55	Sugar, cocoa, gold
British Guiana	·3	Georgetown	63	Gold, sugar
Venezuela	4·0	Caracas	250	Coffee, sugar, cattle, petroleum

NOTE: Some of the figures are merely estimates, and there are several boundary disputes.

QUESTIONS ON CHAPTER XIV

1. On the given map (South America) mark the boundaries of Colombia and of British Guiana, and name (without drawing their boundaries) the countries which touch them. Mark the chief mountain ranges in Colombia and the rivers Magdalena, Orinoco, and Essequibo; the ~~Gulf of Venezuela~~, the ~~Bay of Panama~~, Cape San Roque, the Caribbean Sea, Chimborazo; and the towns Carácas, Cayenne, Colon, Guayaquil, Pernambuco, Potosi, Quito, Truxillo.

2. Give some account of the Argentine Republic, describing its position, climate, and chief industries; and state what are El Gran Chaco, and the Pampas, and where they are situated.

3. Describe briefly the course of the river Amazon, name its chief tributaries, and state what products of economic value are found in the Amazon valley.

4. Mention the chief exports of (i) Brazil, (ii) Chile, (iii) Costa Rica; and state from what parts of Central or South America we get (i) silver, (ii) mahogany, (iii) quinine.

5. Explain briefly the political and commercial importance of the Panama Canal.

6. Give the position of Iquique, Rio de Janeiro, Valparaiso, stating for what they are noted, and showing how their importance depends upon their geographical situation.

What natural disadvantages have Buenos Aires and Bogotá respectively to contend with?

7. Give the position and a brief description of the Falkland Islands, Tierra del Fuego, the Isthmus of Panama, Lake Titicaca, and the Llanos of Venezuela.

8. Describe a coasting voyage from Guayaquil to Buenos Aires, naming the countries passed and describing the general character and aspects of the coasts. Name four ports and three islands on the way, indicating the position of each.

9. Draw a sketch-map of the basin of the river Plate, marking and naming the rivers Parana, Paraguay, Uruguay, and Pilcomayo. Give on your map the names of the countries wholly or partly included in it, and mark the boundaries of Paraguay and Uruguay. Mark Montevideo, Buenos Aires, Asuncion, Rosario, El Gran Chaco.

10. What parts of South America chiefly produce (a) wool, (b) india-rubber, (c) cocoa (cacao), (d) sugar, (e) coffee? How do climate and physical features favour the production of each of these commodities?

11. Name the countries marked by Roman numerals in Fig. 64, and the towns marked by initials.

12. Name the towns marked in Fig. 67.

13. Write short notes on (a) the Magdalena River, (b) the Uspallata Pass, (c) the estuary of la Plata, (d) the Straits of Magellan. Say where they are, and what is their importance.

14. Describe the successive types of climate found along the west coast of South America, from north to south.

15. A ship sailing northward from Punta Arenas along the Atlantic coast of South America calls at four ports before passing Cape San Roque. Name and locate four such ports and account for any cargo the ship might load at each of them.

CHAPTER XV

AUSTRALASIA AND OCEANIA

I. AUSTRALIA

GENERAL

359. Australia (Lat. *australis*, southern) is the smallest of the six continents and the only one that lies wholly south of the equator. The area is nearly three million square miles (about four-fifths of the area of Europe), and a little more than one-third of the area lies within the tropics. The greatest length from west to east, between Steep Point and Cape Byron, is about 2,400 miles, and from North to South, between Cape York and Wilson's Promontory, the distance is about 2,000 miles.

The existence of a large island to the south was vaguely known to the Portuguese who first colonised the East Indies. The Dutch, a little later, explored the north and west coasts, but did not settle. An English expedition under Cook explored the whole east coast about 1770, and in 1788 a settlement for convicts was established at Botany Bay, but was soon transferred to a more suitable site a little farther north at Sydney.

Thus the history of Australia is confined to very modern times. After the transportation of convicts was abolished, colonisation proceeded very slowly, and it was not until the discovery of rich gold-fields in Victoria, about 1850, that there was any large increase of population.

COASTS

360. The coast-line is not, on the whole, very much indented, though considerably more so than the coast of South Africa, which in many respects Australia closely resembles. The largest openings are the shallow Gulf of Carpentaria in the north, with low swampy coasts, and numerous rivers, and the Great Australian Bight in the South.

This is mostly bounded by cliffs about 400 feet high, unbroken by any rivers. To the east of the Bight are the smaller but more important openings of Spencer Gulf, the Gulf of St. Vincent, and Port Phillip Bay. The chief projections of the land are Cape York Peninsula and Arnhem Land in the north, and Yorke and Eyre's Peninsula in the south.

Off the north-east coast, distant from 20 to 100 miles from the land, there is an immense series of coral reefs, called the *Great Barrier Reef*, which is about 1,200 miles long. There are a good many gaps opposite the mouths of rivers, owing to the comparative freshness of the water there (Art. 36).

The Great Barrier Reef acts as a large breakwater for Queensland, but navigation is rather dangerous inside it, owing to the number of small isolated reefs between the Barrier and the shore. Thus, while steamers make use of the calm water inside the Barrier, sailing-ships, which are not so easily controlled, generally sail outside, in deep water free from obstructions.

LAND RELIEF

361. Australia may be broadly divided into three areas.

(i) A low western plateau, occupying about half the continent, west of a line from Eyre's Peninsula to Cape Arnhem. It is mostly from 500 to 1,000 feet in height, but rises to about 3,000 feet in Arnhem Land and in the Macdonell and Musgrave Ranges near the centre of the continent. Between these ranges is the salt Lake Amadeus, and there are many other salt lakes in the south-west of the region.

(ii) A central lowland area from the Gulf of Carpentaria to Spencer Gulf and the mouth of the Murray. This is divisible into three somewhat distinct parts, which are, however, only separated by slight physical barriers—(a) The coast plains on the south of the Gulf of Carpentaria. (b) A large area of inland drainage, with rivers ending in the sand or in salt lakes, of which the largest are Lakes Eyre, Torrens, and Gairdner. Lake Eyre is at, or slightly below, sea-level. This "lake" is strictly speaking not a lake at all now, being crusted over with a thick layer of salt—so thick that part of it has been traversed by motor car. The country round the

lake is sandy desert. The inland drainage area is separated by the Flinders and Barrier Ranges from (c) much the most important of the lowland areas, the basin of the Murray (Art. 362).

(iii) The *Great Dividing Range* is the most important physical feature of Australia, on account of its effects on climate. It occupies the whole of the extreme east and south-east of the continent, forming an unbroken watershed from north to south, never more than about 50 miles from the coast, and in many places nearer. The eastern slope of the mountains is generally very steep, but on the western side the descent is much more gradual, over a wide area of undulating down land.

The range, which is not one range, but a series of many, increases in height from north to south. The highest part of it, the Australian Alps, is in the extreme south. In the Kosciusko group of this range Mount Townsend is 7,300 feet high, about 700 feet above the snow-line. In New South Wales the Dividing Range is known in different parts as the Blue Mountains, the Liverpool Range, and the New England Range. The Blue Mountains lie immediately behind Sydney, and are so difficult to climb on the seaward side that a quarter of a century passed after the first settlement before the range was crossed.

The position of the Great Dividing Range, and especially the absence of easy passes across it, largely account for the small number of seaports in south-eastern Australia, and for the comparatively slow development of the interior of the country.

RIVERS

362. The only important river-system in Australia is that of the *Murray* and its tributaries, occupying the south-east of the continent. The Murray rises in the Australian Alps, and for most of its length forms the boundary between Victoria and New South Wales, but its lower course is in South Australia. The river is navigable by light steamers for several hundred miles, except in very dry seasons, but has a bar at the mouth which prevents the entrance of sea-going vessels.

The bar is a continuation of a sand-spit nearly 100 miles in length, called the Coorong, which has a long narrow lagoon



BRAZIL. STATE OF SÃO PAULO. VIEW OF TYPICAL PLANTATION OF FULLY MATURED COFFEE TREES.
Will F. Taylor.

behind it. The Murray flows through the large shallow Lake Alexandrina just before reaching the Coorong.

All the important tributaries of the Murray are on the right bank and rise in the Great Dividing Range. They are much less constant in volume than the main river, and in dry seasons become little more than strings of pools. The longest tributary is the Darling, which has a sub-tributary, the Condamine. Farther south are the Lachlan and the Murrumbidgee, from the Blue Mountains and the Australian Alps respectively. They unite before reaching the Murray.

The rivers of the inland drainage area are even more intermittent in character, owing to the smaller rainfall of their basins, and they often disappear altogether. The largest of them are the Barcoo or Cooper's Creek and the Diamantina, both flowing south-westward towards Lake Eyre.

The other rivers of Australia, though numerous, are all comparatively short. Among them may be mentioned the Flinders, Burdekin, and Fitzroy in Queensland, the Hunter in New South Wales, the Fitzroy, Ashburton, Gascoyne, Murchison, and Swan in Western Australia. Most of these western rivers, except the Swan, are "mere storm channels filled only during the rainy season" (summer).

CLIMATE

363. The most important factors in determining the climate of Australia are the two facts (1) that nearly the whole continent is in the zone of south-east trade-winds, and (2) that the chief mountains are close to the east coast, but are not of very great height.

The eastern slopes of the Dividing Range, therefore, from Cape Howe to Cape York, face a warm sea-wind, and receive a considerable amount of rain at all seasons, but especially in summer. On the western side of the Dividing Range there is for some distance enough rainfall for pasture grass or for wheat, but the rainfall diminishes gradually towards the west, and the centre and most of the south-west of the continent are almost rainless.

Northern Queensland and Arnhem Land are in the monsoon region, but their seasons are exactly opposite to those of south-eastern Asia. In the southern summer (January) the

winter monsoon of Asia is drawn across the equator, and then blows from the north-west. In crossing the equatorial ocean it absorbs enough water vapour to produce very heavy summer rain all over the extreme north of Australia, which is very dry in the southern winter.

Two separate regions in the south of the continent have a climate of the Mediterranean type, with moderate winter rain and very dry summers. These are (1) the south-west corner of Western Australia, from about Perth to Albany, and (2) the extreme south of South Australia, with the south-west of Victoria. These regions, it will be noticed, correspond in latitude and position with other regions having a similar climate (California, central Chile, the south-west of Cape Colony), *i.e.* they are on the western side of land masses, and in the "Horse Latitudes," between the trade-wind zone and the zone of westerly winds.

Tasmania is entirely south of latitude 40° S., and the prevailing wind throughout the year is westerly, producing a moderate rainfall similar to that of the British Isles.

In summer almost the whole of Australia north of Sydney has an average temperature of over 80°, while the central deserts are at 90° or more. In winter the temperatures vary fairly uniformly from about 75° in the extreme north to about 50° in the south. These figures refer to average temperatures for a month. In summer day temperatures of over 100° in the shade are common everywhere except in the extreme south.

364. The following table gives some climatic data for six stations in Australasia. All are nearly at sea-level, except Kalgoorlie, 1400 feet:—

AVERAGE TEMPERATURE: ° F.

DISTRICT	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Adelaide ..	74	74	70	64	58	53	52	54	57	62	67	71
Brisbane ..	77	76	74	70	64	60	58	60	65	70	74	76
Port Darwin	84	83	84	84	82	79	77	79	83	85	86	85
Kalgoorlie ..	79	77	73	66	58	53	52	54	59	65	72	77
Auckland,												
N.Z.	66	67	65	61	57	54	52	55	55	57	60	64
Suva (Fiji) ..	80	81	80	79	77	75	74	74	74	76	77	79

AVERAGE RAINFALL: INCHES

DISTRICT	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Adelaide ..	.7	.6	1.1	1.8	2.8	3.1	2.6	2.5	2.0	1.7	1.1	1.0
Brisbane ..	6.4	6.3	5.8	3.6	2.9	2.6	2.3	2.1	2.1	2.6	3.7	5.0
Port Darwin	15.8	12.9	9.9	4.2	.7	.2	.1	.1	.5	2.2	4.9	10.4
Kalgoorlie ..	.3	.6	.8	.6	1.4	1.3	.9	1.0	.6	.8	.5	.6
Auckland,												
N.Z.	2.5	2.9	3.0	3.3	4.3	4.6	5.1	4.3	3.6	3.5	3.3	2.9
Suva (Fiji) ..	10.8	9.9	15.0	10.9	9.8	5.6	4.6	7.4	6.7	7.8	9.4	11.9

VEGETATION AND ANIMALS

365. Owing to the extreme dryness of most of the interior, Australia has less forest and more desert, in proportion to its area, than any other continent. A belt of forest extends along most of the north and east coasts, containing in the north many varieties of tropical trees, but in the south consisting mainly of varieties of eucalyptus, which produce both timber and a valuable oil.

Eucalyptus forest is also found in the south-west angle of Western Australia, where there are also two special varieties called jarrah and karri. The former is the best wood for railway sleepers and piles for bridges. Karri is chiefly used for wood paving.

On going inland from the east, beyond the forest belt, a region of pasture grass is found, gradually diminishing in fertility towards the west, with the decreasing rainfall. Grass gives place to a large area of low shrubs called saltbush, and this in its turn to uninhabitable sandy desert, which fills the greater part of the centre and west of the continent.

Amongst the most fertile parts of the pasture lands are the Darling Downs and the Liverpool Plains (Fig. 68), just inside the middle part of the Dividing Range. The district called the Riverina, between the Murray and the Darling, also has good pasture, and so has the hilly and picturesque district of Gippsland, in the extreme south-east. There is much grassland as yet quite unoccupied in the north of Western Australia.

366. The cultivated area of Australia is comparatively small. Wheat is the chief crop, occupying more than half the cultivated area. The "wheat belt" is in two parts;

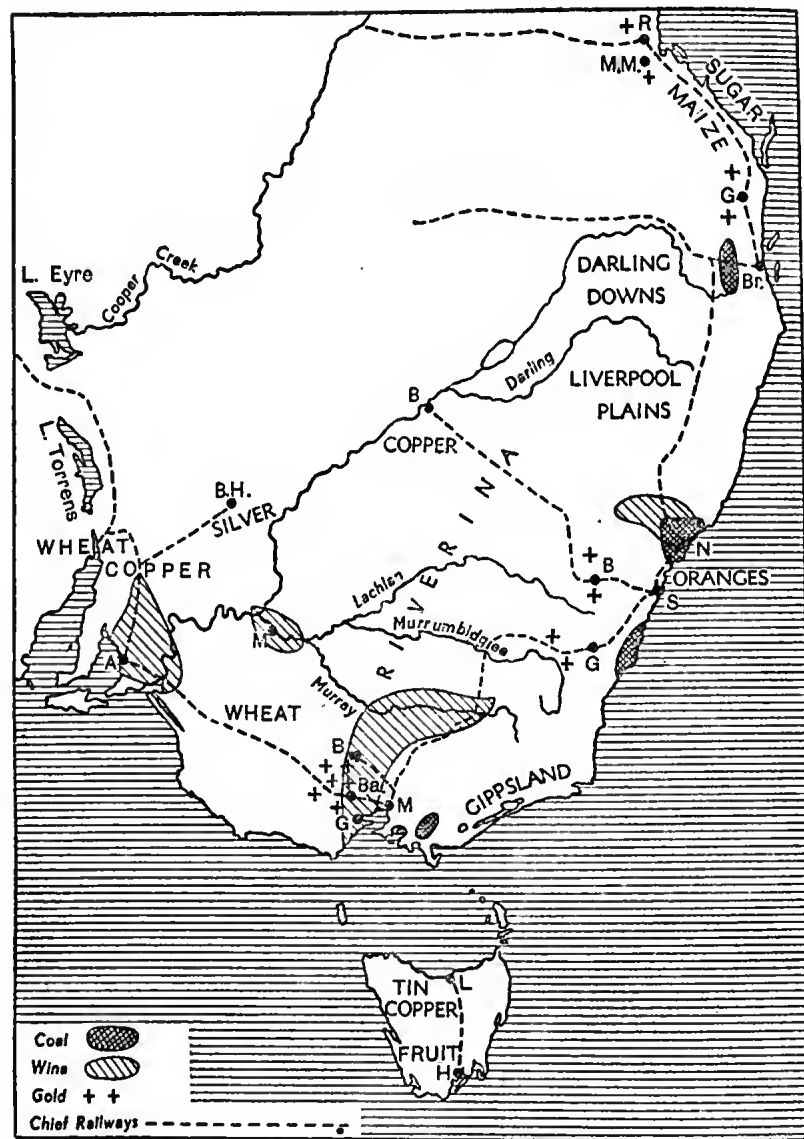


Fig. 68. SOUTH-EASTERN AUSTRALIA.

(a) from about lat. 30° S. in New South Wales, inside and parallel to the Dividing Range, through north Victoria to South Australia, about as far as Eyre Peninsula; (b) in West Australia, an inland belt extending N.N.W. from a little north of Albany to about lat. 30° S. Australia has such a

small population that a large proportion of the wheat is available for export, mainly to England. Irrigated areas in the lower Murray basin produce large quantities of grapes and other fruits, including the special varieties of grapes which, when dried, form raisins and currants. The neighbourhood of Sydney produces oranges and lemons. On the sub-tropical coast plains of southern Queensland maize and sugar are important crops.

The native animals and birds of Australia are very markedly different from those of any other part of the world. The chief animals belong to the class of marsupials—kangaroos, opossums, and wombats—and none of them is of any great size. Animals of this class belong to a much earlier stage in the development of the world, and are hardly found anywhere outside Australia, except as fossilised remains. Large beasts of prey are entirely absent, and there were no animals of the antelope class. Australian birds include the emu, one of the largest of running birds.

The domesticated animals of Europe were soon introduced into Australia, and are now its most important natural resources. The number of sheep varies considerably in different years, but is usually in the neighbourhood of 100 million, of which roughly one-half are in New South Wales. Cattle are far fewer in numbers, and are reared mainly in Queensland, as this state has on the whole more rainfall and richer pastures in the interior. Rabbits have caused great damage in the sheep pastures of Australia, and large sums of money have been spent in efforts to exterminate them or to keep them out of the sheep runs.

The sheep that have been found to thrive best in the dry pasture lands of Australia were mainly introduced from Spain, a land of somewhat similar pastures. Ostrich farming, with birds imported from South Africa, has been successfully tried in South Australia.

Deep artesian wells, tapping stores of underground water, are very important in some of the drier parts of Australia, especially in Queensland. The water is often too much mineralised to be fit for irrigation of crops, but is generally fit for watering stock, and in some cases even for domestic use. These wells have greatly increased the possible area of sheep-farming, and have enabled stock to be moved across areas where such movement was previously impossible.

The only large river in Australia capable of giving a fairly constant supply of water for irrigation is the Murray, with some of its tributaries. There are important irrigation works in the Mildura district.

MINERALS

367. Australia is rich in valuable minerals. The gold-fields of Victoria, round **Ballarat** and **Sandhurst (Bendigo)**, were for many years after 1850 the richest in the world, but their production has greatly decreased. About 1890 there was another "gold rush" to Western Australia, where **Kalgoorlie** is the chief mining centre. In the whole continent, however, gold mining is now a very small industry compared with that of South Africa.

Australia is rich in copper, mainly worked in Queensland and Tasmania. Silver and lead, with some zinc, are mined at **Broken Hill** in the west of New South Wales; tin in the same state, and also at **Herberton** and **Stanthorpe** in Queensland, and in Tasmania. The last state has large metal-smelting and chemical works, based partly on local ores and partly on ores from Australia, and using hydro-electric power.

The coal production of Australia is very small in comparison with that of England (about one-fifteenth), but is greater than that of any other country south of the equator. New South Wales accounts for the greater part of the production, especially round **Newcastle**, north of Sydney, **Wollongong** (the **Illawarra** field), south of Sydney, and **Lithgow**, in the Blue Mountains behind Sydney. The last two fields produce excellent steam coal. Coal is mined in all the other states except South Australia, but at present only on a small scale.

Large deposits of iron ore exist in Australia, but they have been little worked, as they are mostly far from coal. Most of the ore at present used is from **Iron Knob**, a hill of iron ore about 40 miles W.S.W. of Port Augusta, in South Australia. This ore is exported to New South Wales, where there are iron and steel works at **Newcastle** and **Lithgow**, which also make use of smaller quantities of local ores.

Australian coal production is rather more in value than all the other minerals put together. It is followed by silver and lead (extracted from the same ores), gold, zinc.

OCCUPATIONS AND TOWNS

368. Australia is mainly occupied in sheep and cattle rearing, mining, agriculture, and forestry. An extraordinarily large proportion of the people, however, live in large seaports. The capitals of the five states of the continent contain very nearly one-half of the whole population; Melbourne and Sydney alone contain about one-third. This state of affairs is largely due to the facts that the most important productions of the country are for export, mainly to the United Kingdom, that there are very few local manufactures, and that consequently most manufactured articles have to be imported. The foreign trade of Australia is enormous in proportion to its small population. At present the entire continent has less people than "Greater London."

Wool is by far the largest export, representing more than one-third of the total value. Australia is the main source of supply of raw wool for English manufactures. Wool is followed by wheat and flour, butter, frozen meat (mutton, lamb, beef), cane sugar, skins and hides, and metals (gold, copper, tin, zinc). It will be seen what a large proportion of Australian trade depends on its pastoral industries (sheep and cattle). Nearly half the foreign trade of Australia is with the United Kingdom.

369. The seaports are the only considerable towns in Australia, except some of the mining centres which have been already mentioned.

Canberra, in the mountains of New South Wales, roughly half-way between Melbourne and Sydney, was, on account of the rivalry of these two great cities, chosen as a site for the capital of the Commonwealth of Australia. It has the Parliament and government buildings, but is at present quite a small town, of under 10,000 people.

Sydney, capital of New South Wales, is the largest town in Australia, though Melbourne is nearly the same size. Sydney is built on the magnificent natural harbour of Port Jackson. Its suburb of **Parramatta** is famous for oranges.

Melbourne, capital of Victoria, is at the head of Port Phillip Bay. Its population is more than half that of the State of Victoria. **Geelong**, at the west end of the bay, has some woollen manufacture, which is also carried on in the capital.

Brisbane is the capital of Queensland and the nearest port to the fertile Darling Downs. In northern Queensland the chief ports are Rockhampton and Townsville.

Adelaide, the capital of South Australia, is not strictly a seaport, but has a suburb called Port Adelaide on the Gulf of St. Vincent only a few miles away. It is the natural outlet of the lower Murray basin and of the mines of Broken Hill, and is near the most productive part of the wheat belt.

Among inland towns of the south-east of minor importance may be mentioned the agricultural centres of Ipswich in the south of Queensland, on the Brisbane River, Tamworth in the north-east of New South Wales, and Albury, where the main railway line from Melbourne to Sydney crosses the Murray.

Perth, the capital of Western Australia, on the Swan River, is not a port for large ships, but is only about ten miles from the harbour of Fremantle at the mouth of the river, so that the two are in effect one town. Albany is a naval coaling-station on a fine natural harbour in King George Sound.

Almost the only white settlement in the Northern Territory is at Port Darwin, from which a submarine telegraph cable runs to Java and India. Port Darwin is the first Australian landing place on the air route from England to Australia. It is a very small town, but important as an air station.

RAILWAYS

370. The four eastern capitals, Adelaide, Melbourne, Sydney, and Brisbane, are joined by railway, mostly inside the Dividing Range (Fig. 68), and in 1917 Perth was joined up with the others by the completion of a line from Kalgoorlie through the Great Victoria Desert to Adelaide. From Sydney lines run inland to Bourke on the Darling and to Hay on the Murrumbidgee. In Queensland railways from Brisbane, Rockhampton, and Townsville run inland, nearly due west, for several hundred miles.

A transcontinental line from Adelaide to Port Darwin has been projected for many years, but is far from completion. The southern part of it runs from Adelaide through Port Augusta, at the head of Spencer Gulf, to Alice Springs, almost in the centre of the continent. From the north the line has been finished as far as Pine Creek. The Federal Government in taking over the Northern Territory (1911)

undertook to complete the transcontinental railway. A telegraph line along the same route has been in operation for some time.

In Western Australia railways run from Perth southward to Bunbury and Albany, eastward to the gold-fields of Kalgoorlie and Menzies, and northward to Geraldton. From this port a line runs inland to Cue and other gold-fields, and will ultimately be joined by a northward line from Kalgoorlie.

Until 1901 Australia consisted of five separate colonies on the mainland. Each colony developed its railway system quite independently, and the continent has three different railway gauges. New South Wales adopted the English or "standard" gauge of 4 feet 8½ inches. Victoria and South Australia have a gauge of 5 feet 3 inches, while Queensland and West Australia have 3 feet 6 inches. These differences of gauge are, of course, a great hindrance to inter-state travel. The Federal lines built since 1901 are on the standard gauge.

POPULATION AND POLITICAL DIVISIONS

371. The original natives of Australia now number probably not more than 50,000, and are steadily diminishing. Most of them live in the Northern Territory. They are very low in the scale of humanity, and have no close resemblance to any other race. The Tasmanians are quite extinct.

The civilised population is almost exclusively British in origin, to the extent of about 97 per cent. There are a few Chinese and Polynesians (natives of the Pacific islands), but the immigration of both these races is strictly limited by law. The Polynesians were introduced to work in the Queensland sugar plantations, the climate of which renders it almost impossible for white men to work in them.

The "*Commonwealth of Australia*" contains six States (originally separate colonies, which were united in 1901), viz. New South Wales, Victoria, Queensland, South Australia, Western Australia, and Tasmania (Art. 372). There are also two "territories," which, as their white population is extremely small, have no representative institutions, but are governed despotically by the Federal Government. These are the Northern Territory of Australia and Papua or British New Guinea.

A new capital at Canberra, about 150 miles south-west of Sydney, has been specially built for the Parliament and government offices of the Australian Commonwealth.

Owing to the climate a large part of Australia is likely to be always thinly populated, and a considerable proportion of the centre and west is absolutely uninhabitable. The total population of the continent is less than that of "Greater London."

TASMANIA

372. Tasmania is an island nearly as large as Scotland, and is separated from Victoria by Bass Strait. The greater part of the island is occupied by a plateau about 3,000 feet high, rising in Mount Cradle to 5,000 feet. The chief rivers are the *Macquarie*, flowing north into the *Tamar* estuary, and the *Derwent*, flowing south.

Tasmania is the part of the Commonwealth which most resembles the British Isles. The climate is warm, temperate, with abundant rainfall, and is favourable to fruit-growing, especially apples, which form an important export. The chief grain crop is oats. There are valuable deposits of tin, copper, lead, and zinc. The lakes and rivers provide abundant water-power for factories.

The chief towns are Hobart, the capital, on the estuary of the Derwent, and Launceston, on the Tamar.

2. NEW GUINEA

373. New Guinea, separated from Australia by Torres Strait and the Arafura Sea, is the largest island in the world which is not reckoned as a continent. Its area is more than three times that of Great Britain.

A mountainous backbone, rising abruptly from low coast plains, runs from east to west. The Bismarck Range in the centre is over 15,000 feet high. The Owen Stanley Range fills the narrow south-eastern peninsula.

As the island lies between the equator and 10° S., it is in a belt of heavy and almost constant rainfall. It is, consequently, except on the highest summits, densely forested with jungle so impenetrable that large areas of the interior are still unknown. There are many large rivers, some of which (the *Fly* and *Kaiserin Augusta*) are navigable for some distance.

The natives (Papuan), who probably number less than one million, are a branch of the eastern or oceanic negroes. They are very uncivilised, shy, and generally hostile to strangers. The few white men in the island (about 2,000) are chiefly engaged in alluvial gold mining.

The island is divided politically into two parts. The western half is part of the Dutch East Indies; the east, including what was formerly German New Guinea, is governed by the Australian Commonwealth. The chief British settlement and seat of government is at Port Moresby.

3. NEW ZEALAND

GENERAL

374. The group of islands called New Zealand is about 1,200 miles E.S.E. of Australia, the nearest large land mass. They lie almost wholly between 35° and 47° S., that is, in approximately the same latitudes as Italy. The eastern extremity is nearly on the meridian of 180°.

There are two principal islands, the North and South Islands, separated by Cook Strait, about 20 miles wide at the narrowest. The much smaller and almost uninhabited Stewart Island (about three times as big as the Isle of Man) is separated from South Island by Foveaux Strait. The total area of New Zealand is slightly less than that of the British Isles. South Island is almost exactly equal in area to England and Wales.

New Zealand, as a white man's country, is even more modern than Australia, for, though the coasts were surveyed by Captain Cook, there was no settlement until the nineteenth century, and the islands were not officially established as a colony until 1840.

LAND RELIEF AND RIVERS

375. In South Island the chief physical feature is a long chain of mountains near the west coast, descending very steeply to the sea on the west, and more gradually to coast plains on the east. The broadest area of lowland is the *Canterbury Plains*. The central and highest part of the range is called the Southern Alps, in which Mount Cook rises over 12,000 feet. The mountains rise considerably above the

snow-line, and there are large glaciers, some of which descend to within 1,000 feet of sea-level. This fact, remarkable in so temperate a climate, is due to the steepness of the western valleys.

There are many beautiful mountain lakes, of which the largest are Wanaka, Wakatipu, and Te Anau. The first two of these are drained by the *Clutha*, the largest river in the South Island. There are many rivers, and, though as a rule they are not navigable, they are capable of supplying enormous water-power, which will be important when New Zealand becomes a manufacturing country.

The south-west coast of the South Island is much broken up by fjords, here called *sounds*, forming magnificent natural harbours. These, however, are of little use, as the country behind them is too rugged for settlement. Elsewhere in New Zealand good harbours are rather scarce.

The North Island is mountainous in the south-east and centre, and lowland in the north. A line of intense volcanic activity stretches nearly across the island from the two active volcanoes of Ruapehu (9,000 feet) and Tongariro, south of Lake Taupo, to White Island in the Bay of Plenty, noted for its sulphur deposits. In this volcanic region there are many geysers, hot springs, and hot lakes. Farther west is the isolated dormant peak of Mount Egmont (8,300 feet), showing in great perfection the typical conical form of a volcano.

The longest river in New Zealand is the *Waikato*, which is navigable for some distance. It flows through *Lake Taupo*, the largest lake, situated almost exactly in the centre of North Island.

CLIMATE AND PRODUCTIONS

376. The climate varies with the latitude from sub-tropical in the extreme north to cool temperate in the south. Though the latitude is that of Italy, the climate of the South Island is on the whole similar to that of England, but with warmer winters. The rainfall is distributed throughout the year, there being no really dry season. In South Island, owing to the position of the mountains and the prevailing westerly winds, there is, as in Great Britain, a marked difference between the rainy west and the moderately dry eastern plains.

About two-thirds of the area of New Zealand is fit for agriculture or grazing, but a large part of this area is still forested. The chief forest tree is the kauri pine, which furnishes, besides timber, a valuable resin, kauri-gum, used for making varnishes. It is chiefly obtained, however, not from the living tree, but in the fossilised form underground, and is officially reckoned as a mineral. New Zealand is remarkable for its beautiful tree ferns, which sometimes reach a height of sixty feet.

The chief crops are oats and wheat, but pasture is more important than agriculture, and all the leading exports—wool, frozen meat, butter, cheese, hides, and skins—are animal products. New Zealand possesses about 27 million sheep, more than a quarter of the number in Australia. The best area for sheep is the Canterbury Plains, on the east side of South Island. English fruits flourish in South Island, and "southern" or sub-tropical fruits (oranges, lemons, grapes) in the north of North Island.

When first occupied by the British, New Zealand was even more destitute of animals than Australia, the largest mammal being a species of small dog, now extinct, while lizards were the only reptiles.

The most important mineral productions are coal and gold, found mainly in South Island. The production of gold is decreasing, as in Australia, but the output of coal shows a steady increase. The chief coal-field is in the north-west of South Island, between Greymouth and Westport.

POPULATION AND TOWNS

377. The original natives of New Zealand, the Maoris, probably of a race akin to the Malays, number only 50,000, and do not increase. They live chiefly in North Island. They are a brown-skinned, intelligent, and artistic race, a great contrast to the Australian natives, but were ferocious cannibals at the time of the British settlement. There were several Maori wars against the settlers before peace was finally established.

The rest of the population, numbering about one and a half million, is almost exclusively English, Scottish, or Irish in origin. The Scots settled chiefly in the south of South Island, as is indicated by the names of towns there. There

are more people in North than in South Island, owing to the fact that the latter contains a considerable area of barren mountain.

New Zealand has four large towns, two in each island. The largest of these, Auckland (220,000) formerly the capital, is beautifully situated at a point where the North Island is only about six miles wide, between Manukau Harbour on the west and Waitemata Harbour on the east. The former is too shallow for large ships, so that the main part of the town is on the eastern side.

Wellington (145,000), on the north side of Cook Strait, was selected as the capital, in place of Auckland, on account of its central position for both islands. It exports chiefly dairy produce. Christchurch (130,000), the largest town of South Island, is a few miles inland on the Canterbury Plains. Its seaport is Lyttelton, which exports wool and frozen meat.

Dunedin (88,000), at the head of Otago Harbour, is the outlet of the southern gold-fields. Large ships cannot reach the town, but stop at Port Chalmers, lower down the harbour. Among towns of the second rank may be mentioned Invercargill, on Foveaux Strait, Napier, on Hawke Bay, and Timaru, at the south end of Canterbury Plains.

4. PACIFIC ISLANDS

✓ 378. The many thousands of small islands in the central and western Pacific have, excluding New Zealand, a total area only about equal to that of England and Wales. They are generally divided into four large sections.

(1) Melanesia ("islands of the blacks") lies to the east of New Guinea, and includes the Bismarck Archipelago, Solomon Islands (British), New Caledonia (a French convict station), and the New Hebrides (joint British and French rule). The Melanesians are a woolly-haired negroid race, similar to the Papuans of New Guinea. Cannibalism is still prevalent in places.

(2) Micronesia ("small islands") lies mostly to the north of Melanesia, about as far eastward as long. 180°, and includes the Ladrone, Caroline, and Marshall Islands.

(3) Polynesia ("many islands") includes the very numerous groups in the central Pacific. The Polynesians are a

copper-coloured people akin to the Maoris. Many of them were until recently cannibals.

Most of Polynesia is British, but several of the groups farthest east belong to France (Society Islands, Marquesas, and Paumotu). Part of Samoa belongs to U.S.A.

(4) Hawaii. See Art. 380.

Of the numerous Pacific Islands formerly belonging to Germany, those north of the equator have been allotted to Japan, those south of the equator to Australia, except Samoa, which is under New Zealand.

379. The islands of "Oceania" or "the South Seas," as this region is variously termed, are either mountainous volcanic islands, generally several thousand feet high, or low coral atolls (Art. 37). The high islands also are generally fringed with coral reefs.

Most of the islands are in the trade-wind zone, and have a healthy, equable, somewhat rainy climate. The chief vegetable products are the bread-fruit tree, supplying the staple food of most of the natives, and the coco-nut palm, supplying the chief commercial product of the islands, copra, which consists of the dried kernels of the coco-nut, and is used for making oil and soap. Sugar, maize, yams, and bananas are cultivated on some of the larger islands.

"That wide field of ocean, called loosely the South Seas, extends from tropic to tropic, and from perhaps 120° W. to 150° E., a parallelogram of one hundred degrees by forty-seven, where degrees are the most spacious. Much of it lies vacant; much is closely sown with isles, and the isles are of two sorts. No distinction is so continually dwelt upon in South Sea talk as that between the 'low' and the 'high' island, and there is none more broadly marked in nature. The Himalayas are not more different from the Sahara. On the one hand . . . volcanic islands rise above the sea; few reach an altitude of less than 4,000 feet; one* exceeds 13,000 . . . they are clothed with various forests, and are remarkable for picturesque and solemn scenery. On the other hand we have the atoll . . . rudely annular† in shape; enclosing a lagoon; rarely extending beyond a quarter of a mile at its chief width; often rising at its highest point to less than the stature of a man—man himself, the rat and the land-crab, its chief inhabitants; not more variously supplied with plants; offering to the eye only a rim of glittering beach and verdant foliage, enclosing and enclosed by the blue sea."

R. L. STEVENSON: *In the South Seas*.

* Hawaii.

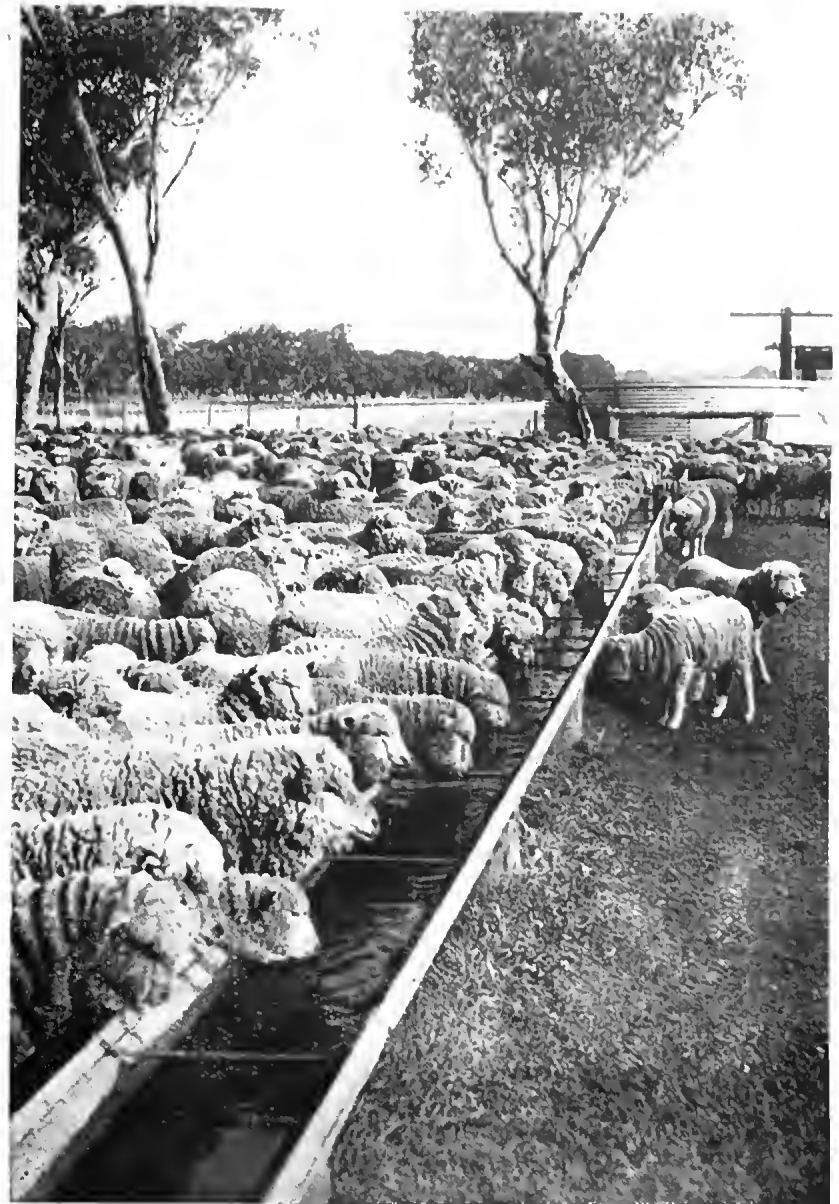
† Ring-shaped.

FIJI AND HAWAII

380. The Fiji Islands are the most important British possession in Polynesia. They lie about Lat. 18° S., very nearly on the meridian of 180° . There are two large volcanic islands, Viti Levu and Vanua Levu (together nearly as large as Wales), and over 200 small islands, of which 80 are inhabited. There are important sugar plantations on the main islands. The capital is Suva, on the south coast of Viti Levu. Nearly half the population of Fiji consists of Indians.

The Hawaiian or Sandwich Islands, just south of the northern tropic, are a territory of the United States. The largest island, Hawaii, about equal in area to Devon and Cornwall, contains two enormous volcanic cones, Mauna Kea and Mauna Loa, rising nearly 14,000 feet above the sea. Mauna Loa is still active, and besides the crater on its summit has at a much lower level the great crater of Kilauea, a lake of lava about three miles in diameter. The small island of Molokai is a leper settlement.

The capital and largest town of the Hawaiian group is Honolulu, on the island of Oahu, 2,000 miles from San Francisco, and 3,500 miles from Yokohama. It is a very convenient calling-place for steamers from the west of North America to China, Japan, Australia, or New Zealand. The chief products of the islands are sugar, pineapples, bananas, and rice. The population consists chiefly of Japanese, Chinese, and Europeans. The native Hawaiians form less than one-fifth of the total, and, like nearly all the island races of the Pacific, are dying out.

*Will F. Taylor*

AUSTRALIA. DRINK FOR 5,000 THIRSTY SHEEP AT A RANCH
AT WANAH.

In many parts of Australia the only available water for stock is pumped from Artesian wells.

AUSTRALASIA

	AREA 1000 SQUARE MILES	POPULATION THOUSANDS	CAPITAL	POPULATION THOUSANDS	LEADING EXPORTS
New South Wales ..	310	2600	Sydney	1400	Wool, butter, wheat, meat
Victoria ..	88	1820	Melbourne	1150	Wool, wheat, wine, fruit
Queensland ..	670	945	Brisbane	370	Meat, hides, butter, sugar
South Australia ..	380	580	Adelaide	350	Wool, wheat, fruit
Western Australia ..	976	440	Perth	225	Gold, wheat, wool
Tasmania ..	26	230	Hobart	70	Fruit, metals, wool
Northern Territory ..	524	5*	Port Darwin	—	—
Commonwealth of Australia	2974	6620	Canberra	13	Wool, wheat, gold, butter, meat
Dominion of New Zealand ..	105	1465	Wellington	150	Wool, mutton, butter, cheese
Fiji ..	7	190	Suva	13	Sugar, copra, bananas
NEW GUINEA—					
British† ..	180	680	Port Moresby	—	} Copra, pearls, gold
Dutch ..	152	200	—	—	

* Exclusive of aborigines.

† Papua and "Territory of New Guinea."

QUESTIONS ON CHAPTER XV

1. Give some account of the peculiar characteristics of Australian rivers. Describe fully the course of one; give the position of four others, naming the states through which they flow, and give the positions of their mouths.

2. Name the chief ports of the Australian States, and show how the seasons affect the trade between Australia and England. Describe briefly the route by which an Australian could visit England (i) via Honolulu, or (ii) via the Suez Canal.

3. On the given map (Australia) mark the boundaries of its five divisions and name them. Mark and name the Great Dividing Range, Flinders Range, Darling Range; the Swan and Murray rivers; Gulf St. Vincent, Port Jackson, Lake Eyre; Adelaide, Ballarat, Brisbane, Fremantle, Hobart, Newcastle.

4. (i) Name the chief localities in Australia in which the following minerals are found: coal, copper, gold, silver, tin.

(ii) State in which districts of Australia cattle and sheep are reared, and corn and sugar are produced. Give reasons for your answer.

(iii) Account for the desert region of Australia.

5. Draw a sketch-map of Australia. Mark Bass Strait, Spencer Gulf, Cape Howe; Lake Amadeus, Lake Torrens, Swan River, the Blue Mountains, Flinders Range; Adelaide, Albany, Geelong, Perth, Rockhampton.

In what direction do the great rivers of Australia flow, and why?

6. State approximately the population of Australia, and its size as compared with Europe; describe and account for the condition of its inner regions; specify those parts of Australia where population is most concentrated; explain why they have attracted most settlers.

7. Compare the food-products of Australia with those of New Zealand, pointing out how climate and other physical features affect the kind of product. What parts of Australia produce (i) coal, (ii) tin?

8. Give an account of the physical features and natural products of Tasmania, and state what you know of the climate, inhabitants, and government of New Guinea.

9. Draw a sketch-map of the coast of South Australia, Victoria, and New South Wales, with Tasmania and Kangaroo Island. Name four bays or gulfs. Mark the rivers Murray and Darling; the Blue Mountains and Australian Alps; Lakes Gairdner and Alexandrina and Liverpool Plains; Broken Hill, Launceston, Melbourne, and Sydney.

10. State what you know of the rainfall, temperature, winds, and water-supply of Australia.

11. State from what districts in Australasia England obtains (a) dead meat, (b) gold, (c) tin, (d) wool.

12. Name four island groups of Melanesia (omitting New Guinea) and the nations to which they belong. Give a short description of the islands as a whole, and mention the chief products of Melanesia.

13. Draw a sketch-map of New Zealand. Mark the chief bays and straits; Auckland, Christchurch, Dunedin, and Napier; Mounts Cook and Egmont; Lakes Taupo and Wakatipu, and the river Molyneux (Clutha).

14. Give an account of the vegetable and mineral products of New Zealand.

15. Draw a sketch-map of New Zealand. Mark Hawke Bay, Bay of Plenty, Banks Peninsula, Cook Strait, Foveaux Strait, Southern Alps, Mount Egmont, Lake Taupo, the river Clutha, Auckland, Christchurch, Dunedin, Invercargill, Wellington, Westport.

16. State what you know of the climate and interior of New Guinea. To whom does the island belong?

17. Give the situation of Canterbury Plains, New Caledonia, Port Moresby, and state any important facts connected with each.

18. Give in outline the various routes by which New South Wales may be reached from London. By which route would you prefer to make this journey, and why?

CHAPTER XVI

THE BRITISH EMPIRE

GENERAL

381. The King of England is officially styled "King of Great Britain and Northern Ireland, and of the British Dominions beyond the Seas, Emperor of India." These "dominions beyond the seas," together with India, cover an area of nearly 12 million miles, about a hundred times the area of the British Isles, and about one-fifth of the entire land area of the world. The population, including the mother country, is now estimated at nearly 540 millions, which is probably about one-quarter of the population of the world, though the latter is not known with any degree of accuracy. There are at least fifty separate colonies and dominions within the British Empire.

Of the total area of the Empire, America contains about four million square miles, Australasia and Africa over three millions each, and Asia approximately two millions. The distribution of population is strikingly different from that of area. India alone, with an area about one-seventh of that of the Empire, contains nearly three-quarters of the total population (389 millions in 1941). The population of the British Isles is about one-tenth of the whole, while the vast area of British America contains only one-fortieth of the population of the Empire.

The British Empire is essentially an *oceanic* empire, with possessions in every continent and coasts on every ocean. It is thus sharply distinguished from the Russian and Chinese territories, which are single compact land-masses. A large proportion of British colonies are islands, and, even in the case of the continental possessions, communication between them is almost invariably easier and quicker by sea than by land.

GOVERNMENT AND CLASSIFICATION

I. INDIA

382. India is divided into two main divisions, politically: (1) the *Provinces*, or those areas which have been under direct British rule, and occupy nearly two-thirds of the total

area. (2) The *States*, governed by their own hereditary Indian rulers, who have considerable powers in their own territories, and except in cases of very serious misrule, have not been much interfered with by the Government of India.

Till 1919 the government of "British India," *i.e.* the provinces, was a "benevolent despotism"; the Indian peoples had no voice in making the laws which governed them. The government was vested in a *Viceroy* or Governor-General, appointed by the English government, generally for five years, and assisted by a Council of high officials. All the higher posts in the Indian Civil Service were held by Englishmen. The Viceroy was responsible to the Secretary of State for India in the British Parliament.

Since 1919 considerable powers of self-government have been granted to India, and the India Act of 1935 established a new constitution, which for the first time brought the "States" into union with the "Provinces" in a Federal Parliament for all India, under which, however, the states and provinces retained considerable powers of local self-government.

Since 1935 various attempts have been made by British Governments to secure sufficient agreement amongst Indians themselves to enable them to evolve a national constitution, and so to achieve either complete independence or *Dominion* status within the Empire (Art. 384). So far these efforts have not been successful.

Under the new Act *Burma*, which in many ways is very different from India in people, religion, and culture, was separated from India and made a separate state.

The chief "provinces" of India are Madras, Bombay, Bengal, United Provinces (Agra and Oudh), Punjab, Bihar and Orissa, Central Provinces, Assam, North-West Frontier Province, Baluchistan, and Delhi.

The chief "states" are: Hyderabad, Mysore, Gwalior, Travancore, Kashmir, and the numerous states of Rajputana.

383. It should be remembered that India is more a continent than a "country," if "country" means, as it generally does in Europe, a land inhabited by people more or less of the same race and language. "The population (of India) is an immense mixed multitude in different stages of material and moral growth, exhibiting an extraordinary variety of

peoples, creeds, and manners. Much of India may still be regarded as the best surviving specimen of the ancient world on a large scale."* Observers distinguish seven *main* physical types, with *marked* differences of colour, build, height, shape of head, features, and hair. There are at least thirty distinct languages, besides very numerous dialects. "It has been said that the languages of southern India are as unintelligible in Lahore as they would be in London, and that a native of Calcutta or Bombay is as much a foreigner in Delhi or Peshawar as an Englishman is a foreigner in Rome or Paris."*

2. THE DOMINIONS

384. The self-governing Colonies are six in number, viz. the Dominion of Canada, Newfoundland, the Union of South Africa, the Commonwealth of Australia, the Dominion of New Zealand, and (at any rate in theory) Eire, formerly the Irish Free State. These countries are practically in the position of independent nations, though owning allegiance to the British Crown. In each of them a governor represents the King, but like the King at home, he can only act through his ministers. In each colony there are elected Parliaments, consisting, like the British Parliament, of two chambers. The self-governing colonies are now generally known as the "*Dominions*," to distinguish them from other colonies. They are represented as separate nations in the League of Nations, and some of them send ambassadors to other countries, as sovereign independent States.

In all the above colonies, except South Africa, white people form the great mass of the population. Australia, New Zealand, and Newfoundland are almost exclusively British. In eastern Canada there is a large French element in the population. In South Africa a large majority of the people are negroes, and of the whites a considerable proportion are Boers of Dutch origin.

Newfoundland was occupied by the English in 1583; Nova Scotia in 1627; the rest of eastern Canada was conquered from the French in 1759. In 1867 the provinces of eastern Canada—the only part of the country then occupied—were united into a "*Dominion*," which has since added the central and western provinces.

* Sir T. W. Holderness.

The Australian Commonwealth was formed in 1901 by the union of six previously quite separate colonies (Art. 371). The Union of South Africa was formed in 1910 from the four colonies of the Cape of Good Hope, Natal, the Orange Free State, and the Transvaal. New Zealand has all been under one government since it was established as a colony in 1840.

3. COLONIES WITH PARTIAL SELF-GOVERNMENT

385. A number of colonies have elected councils which have power, with certain restrictions, to make laws, but the home government retains the appointment and control of the chief public officers and also retains a veto on legislation. The chief colonies which have this limited amount of self-government are Ceylon, Malta, Mauritius, Bermuda, British Guiana, and the six groups into which the British West Indies are divided, viz. the Bahamas, Barbados, Jamaica, Leeward Islands, Windward Islands, and Trinidad with Tobago. Ceylon is to become largely self-governing in the near future, with a parliament on the British model.

4. CROWN COLONIES

386. Crown colonies have no self-government at all, being entirely controlled by the home government. The governor of the colony frequently has a nominated council to assist him, but the council is only advisory. The most important Crown colonies are Gibraltar, Aden, the Straits Settlements, Hong Kong, Fiji, Nigeria, the Gold Coast, Sierra Leone, Kenya and British Honduras. It will be noticed that, except Gibraltar, which is simply a fortress (area less than two square miles), all these Crown colonies are in the tropics. Aden, like Gibraltar, is important mainly as a fortress. The others are inhabited by "coloured" races of many varieties, and the British form only a very small governing or trading class.

5. OTHER POSSESSIONS

387. A considerable part of the British Empire has been acquired in times past by trading companies, which have received "Charters" from the home government entitling them to occupy and govern land (generally in more or less uncivilised countries) for the purpose of developing the resources of these countries, and affording security for traders.

Thus the East India Company, the Hudson Bay Company, the Royal Niger Company, and the British South Africa Company acquired large territories in India, Canada, and West and South Africa respectively, but finally were compelled to surrender their privileges to the Imperial government.

The term "*Protectorate*" is a vague one, almost impossible to define accurately. As a rule our protectorates began with measures to stop warfare in savage countries, or to put down piracy or the slave-trade. Then a certain amount of effective law and order is introduced, and some protectorates have reached, or are reaching, the Crown colony stage. In cases, however, where there are capable and friendly native rulers (as in Basutoland and Bechuanaland) there is very little interference with them. The chief protectorates are in Africa: Basutoland, Bechuanaland, Nyasaland, Zanzibar, Uganda, and British Somaliland. In Asia the protectorates are the Federated Malay States in the Malay Peninsula, and Sarawak in Borneo, of which the hereditary sovereign is an Englishman. Great changes are pending in the status of these two protectorates, however.

DEFENCE

388. In times of peace the British Army serving abroad has hitherto numbered as a rule about 120,000 men, of whom about 75,000 have been in India, almost the only part of the Empire which might conceivably be attacked by land. The other British troops have mainly been in Gibraltar, Malta, Egypt, Aden, South Africa, Bermuda, Mauritius, and Hong Kong. The first four of these are on the road from England to India, and are therefore of obvious naval and military importance, while Gibraltar is also the headquarters of the British Atlantic Fleet. The Dominions and some of the Crown colonies have military forces of their own, and some of the Dominions make contributions towards the cost of the British Navy, as well as having warships of their own.

COMMERCIAL RESOURCES OF THE COLONIES

389. The following lists show some of the most important exports of the colonies, which go largely, but by no means entirely, to the United Kingdom. As the lists give only exports, viz. those articles of which a country produces more

than enough for its own needs, some important articles of production may be omitted. Thus, for instance, India grows far more sugar than any other part of the British Empire, but still not enough for its needs, and sugar forms a large import of India, not an export.

1. ARTICLES OF FOOD AND DRINK

Wheat: Canada, Australia.

Meat: Canada, New Zealand, Australia.

Dairy Products: Canada, New Zealand, Australia.

Fish: Newfoundland, British Columbia.

Fruit: West Indies, Canada, Australia.

Rice: Burma.

Tea: India, Ceylon.

Sugar: West Indies, British Guiana, Mauritius, Fiji, Queensland.

2. MINERALS

South Africa: gold, diamonds.

Canada: silver, gold, copper, nickel, asbestos.

Australia: gold, silver, copper, tin.

Federated Malay States: tin.

3. MATERIALS FOR MANUFACTURE

Wool: Australia, New Zealand, South Africa.

Cotton: India, Sudan, Nigeria.

Rubber: Straits Settlements, Ceylon.

Jute: India.

Timber: Canada, Australia, British Honduras, India.

Palm oil: West Africa.

QUESTIONS ON CHAPTER XVI

1. Give some account of the methods of government adopted in different types of British Colonies. Explain the terms "feudatory state" and "protectorate."

2. From what parts of the British Empire do we obtain jute, sugar, teak, tea, and wool? What are the chief wheat-growing areas within the Empire?

3. Name the British self-governing colonies, and in each case give three of the most important exports.

4. In the course of a voyage to Australia via the Suez Canal, what other British possessions would be passed or called at? Write brief notes on each.

5. Where are the chief coal-fields in the Southern Hemisphere?

6. Give a brief account of the method of government in the Indian Empire.

7. Describe the position and the past or present importance of Bermuda, St. Helena, the Falkland Islands, Fiji, Singapore.

8. What is the value to the British Empire of (a) Gibraltar, (b) Malta, (c) Cyprus?

9. Choose two of the following plants: wheat, rice, and rubber. Name *one* part of the world where each is produced in large quantities. and explain why it is produced there.

10. Write a brief geographical account of either British Guiana or British Honduras, noting relief, climate, and chief products.

11. Choose three important British ports in Africa, one on the west coast, one on the east coast, and one in the south. Give the position of each port, name the region it serves, and show how goods for export are brought to it.

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[The numbers refer to Sections, not pages.]

PRINCIPAL ABBREVIATIONS

C. = cape	Mt. = mountain
Is. = island(s)	R. = river
L = lake, loch, lough, etc.	Str. = strait

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